

City of Torrance

2018 COMMUNITY RISK ASSESSMENT STANDARDS OF COVER

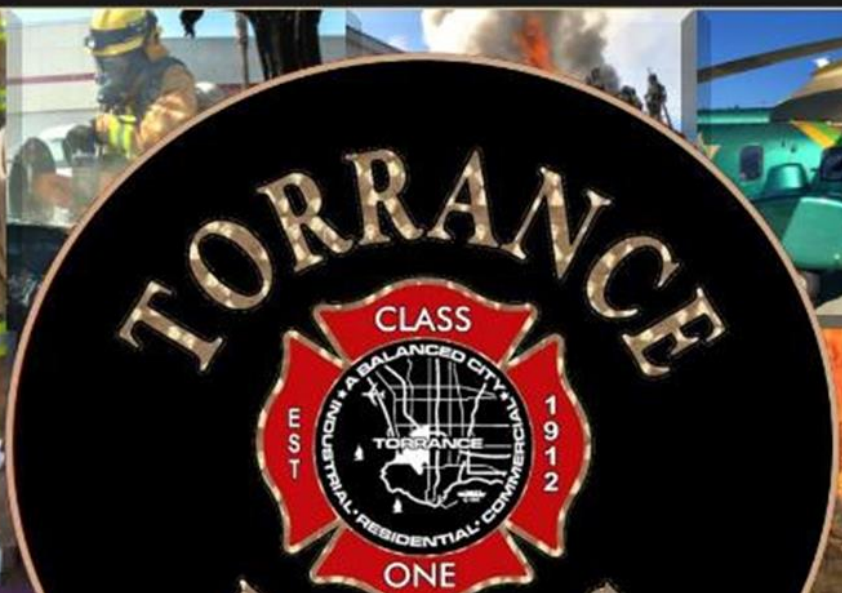








Table of Contents

Introduction

The fire service has traditionally excelled at customer service; however, the same fire service has struggled to adequately define, validate, and articulate the levels of service provided to the community. A Community Risk Assessment: Standards of Cover (CRA-SOC) document is designed to provide the community and elected officials an overview of TFD operations related to community risk management based in facts and numbers. These facts allow for decisions based on data rather than emotion. The CRA-SOC is one of three foundational documents required for international accreditation through the Center for Public Safety Excellence (CPSE) and Commission on Fire Accreditation International (CFAI). The TFD CRA-SOC is to be used in conjunction with the TFD 5-year Strategic Plan and the TFD Self-Assessment Manual to provide policymakers with the required information to make informed decisions. The CRA-SOC is not intended to be a stand-alone document.

The CRA-SOC is a critical part of the department's continuous improvement process. The document is divided into sections to allow for easy retrieval of information. The sections include: The Community Served; Fire Department Overview; Community Risk Assessment Overview; Community Risks by Hazard Category; Deployment and Coverage Strategies; Deployment and Coverage Performance; Findings and Recommendations; and Evaluation and Compliance Methodology.

The CRA-SOC provides a deployment analysis to determine the distribution and concentration of fixed and mobile resources within the TFD. Additionally, the CRA-SOC serves the following purposes:

- Tool for defining service level benchmarks
- Tool for defining the current performance or baseline of the TFD
- Validates fire station locations and resources contained within
- Management tool for determining apparatus type and staffing based on national standards and community expectations
- Predictive tool for determining workload and unit utilization
- Measurement tool for service level performance

While developing this CRA-SOC, it became clear that TFD needed to establish service level goals. As TFD proceeded to establish its service level goals, it did so based on the national standards such as NFPA 1710, the CFAI accreditation model, the ISO grading schedule, historical response data, and TFD personnel and community expectations.

This document was created by a committed team striving for continuous improvement in today's "all-risk" fire service. We welcome your feedback and are honored to serve as members of the TFD.

Section 1 - Community Served

City of Torrance Mission Statement

The mission of the City of Torrance is to encourage and respond to community participation as we provide for an attractive, clean, safe, secure and enriching environment that assures a high quality of life.

We evaluate and act on the needs of the community within a complex, changing environment. We provide quality service with integrity, professionalism and accountability in an efficient, cost-effective manner.

City History

In 1910, prompted by developing labor troubles in Los Angeles, a real estate developer from Pasadena named Jared Sidney Torrance decided to build a "workingman's paradise" -- a model industrial city halfway between Los Angeles and the San Pedro harbor. He formed the Dominguez Land Corporation and spent $1 million to buy 3,522 acres from the Dominguez family for the new city. Officially founded in 1912, Torrance was to be “A Balanced City” made up of a mixed industrial-residential community.

The city was planned by world-famous landscape architects Olmsted and Olmsted in accordance with Jared Sydney Torrance's master plan. Along the City's eastern boundary, J.S. Torrance envisioned commercial and industrial zones physically separated from residential areas to the west. The reason for this design was due to the great amount of smoke generated by the City's early industries. Winds blew dependably from the west and generally kept the residential areas free of smoke. Today, this wind continues to provide residents relief from heat and smog.

On the night of November 12, 1912, local businessmen met in a tent to discuss the needs of protecting the community from the threat of uncontrolled fires. These men felt that protection from fire was of prime importance and at 8:00 p.m. that evening, the businessmen and residents established the Torrance Volunteer Fire Department. Today the Torrance Fire Department (TFD) is a nationally recognized ISO Class 1 Fire-EMS Department. This evolution was the result of many strong leaders that shared a commitment to protecting lives and property.

Figure 1: Pacific Electric Railway – El Prado Bridge

Torrance incorporated as a city in 1921, and through gradual annexation increased to its present-day size of 21 square miles, including a 1.5-mile beachfront. A late 1940s housing boom consumed virtually all the remaining vacant land and the population rapidly expanded to 140,000+ today.

Physical Setting

Torrance is a city in the South Bay region of Los Angeles County, approximately 11 miles from downtown Los Angeles at its closest point. As of 2014, Torrance had an estimated population of 147,181, making it the eighth-most populous city in Los Angeles County. Located in the urbanized Los Angeles Basin, Torrance is almost entirely developed and mostly surrounded by other urban areas. Although residential land uses make up approximately half of the community's area, Torrance also has extensive retail, office, and industrial land uses.

Torrance is bordered by the cities of Lawndale and Gardena and the unincorporated community of El Camino Village to the north, by the cities of Los Angeles and Lomita to the east, by the cities of Rolling Hills Estates and Palos Verdes Estates to the south, and by the city of Redondo Beach and the Pacific Ocean to the west. Interstate 405 runs through the northern part of the city; the Pacific Coast Highway (State Route 1) runs through southern Torrance; and Hawthorne Boulevard (State Route 107) runs through the length of the city. The community is divided roughly in two by rail lines, which are currently only used for freight.

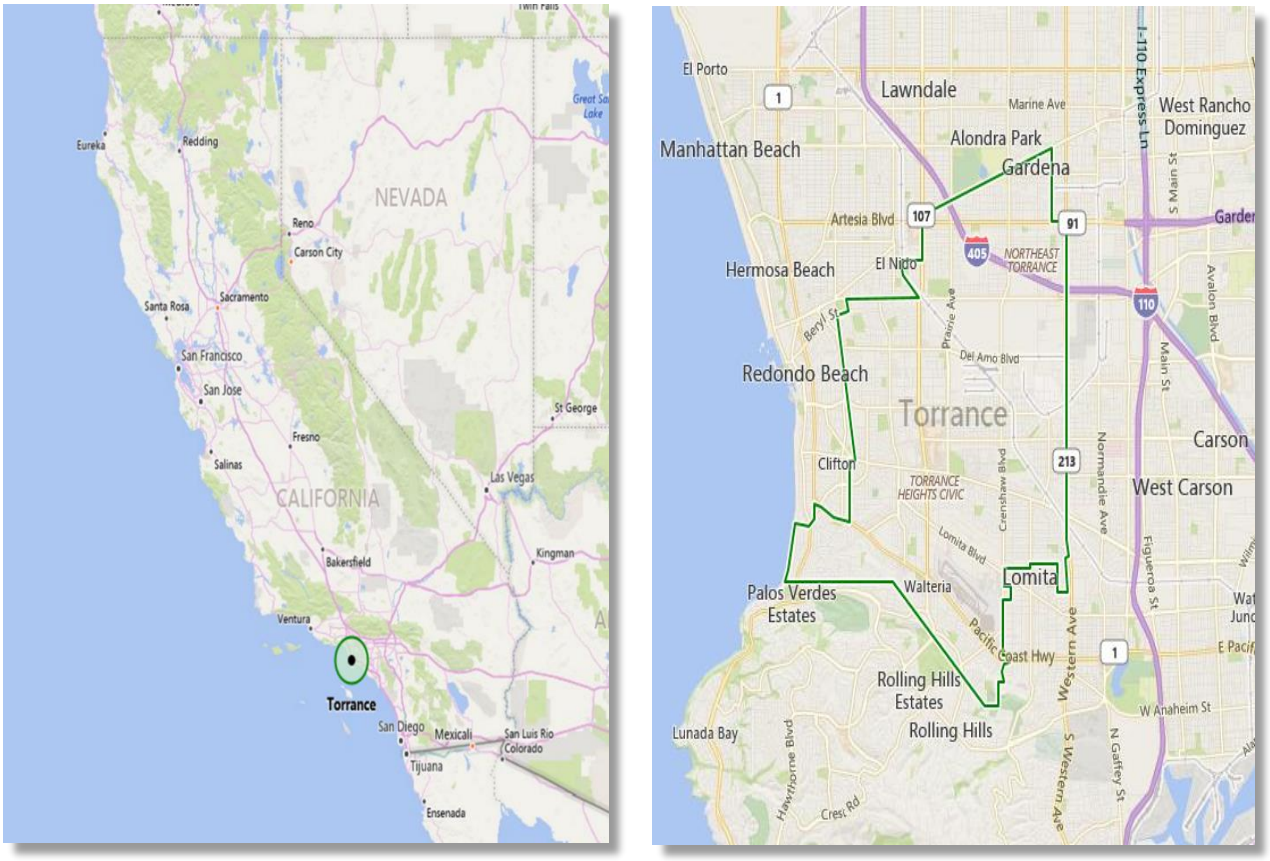


Figure 2: Torrance within California and Torrance within the surrounding area – Source: Bing.com Maps

Climate

Torrance has a Dry-Summer Subtropical climate with warm dry summers and mild winters. On average, Torrance enjoys 279 sunny days per year. The average summer high is 76.2 degrees Fahrenheit. The average winter low is 46.7 degrees Fahrenheit.

Precipitation averages in Torrance are around 14.45 inches per year with measureable rain (.01") occurring 22.3 days per year. The rainy season is from November through March. Rainfall in Torrance tends to fall in large amounts during storms rather than consistently at somewhat regular intervals. These storms can bring significant onshore winds into the area. Torrance does not experience snow events.

Torrance is subject a weather phenomenon called "June Gloom or May Gray", which sometimes brings overcast or foggy skies in the morning on the coast, followed by sunny skies by noon during late spring and early summer.

SEASON	PRECIP (IN)	MIN TMP (°F)	AVG TMP (°F)	MAX TMP (°F)
Annual	14.45	53.8	62.6	71.3
Winter	9.14	46.7	56.2	65.7
Summer	0.14	60.6	68.4	76.2
Spring	3.20	51.9	60.6	69.4
Autumn	1.97	55.9	64.9	73.9

Figure 3: Torrance Climate Source: https://www.ncdc.noaa.gov/cdo-web/datatools/normals

Topography

The City's elevation starts at sea level and continues to rise to 1443 feet above sea level along the southern border of the community along the base of the Palos Verdes Peninsula. With the exception on the southern border and a few elevation increases along the western border, Torrance is considered to be relatively flat.

Figure 4: Torrance Topography Source: USGS

Population

As of 2017, the US Census estimates 150,439 residents in Torrance. The average Torrance resident is older than the average resident of Los Angeles County. Torrance residents are also more likely to have a higher household income and to have a smaller number of people in their household. The table below shows the summary demographics for Torrance. Historically, as populations increase the call volume for fire and EMS services increase. According to estimates provided from ESRI based upon the US Census, Torrance can expect an increase of population of .51% per year between 2017 and 2022 resulting in a 2022 population estimate of 154,339. This is a trend the TFD will monitor and make deployment adjustments as needed based upon hard data.

Category	
Total population	150,439
Daytime population	201,909
Population density per Sq. Mile	7,320
Median age	43.0 years
Elderly population (65+ years)	17.5%
Median home value	$683,995
Number of households	54,564
Average household size	2.64
Median household income	$83,054
Language other than English spoken at home	39.1%

Figure 5: Torrance Population, US Census 2017

Figure 6: 58th Annual – Armed Forces Day Parade

Population Density

The map below provides an overview of population density within city boundaries. The legend shows the amount of people per census block. There are 2102 census blocks represented in the map below which are either within or touching the city boundary.

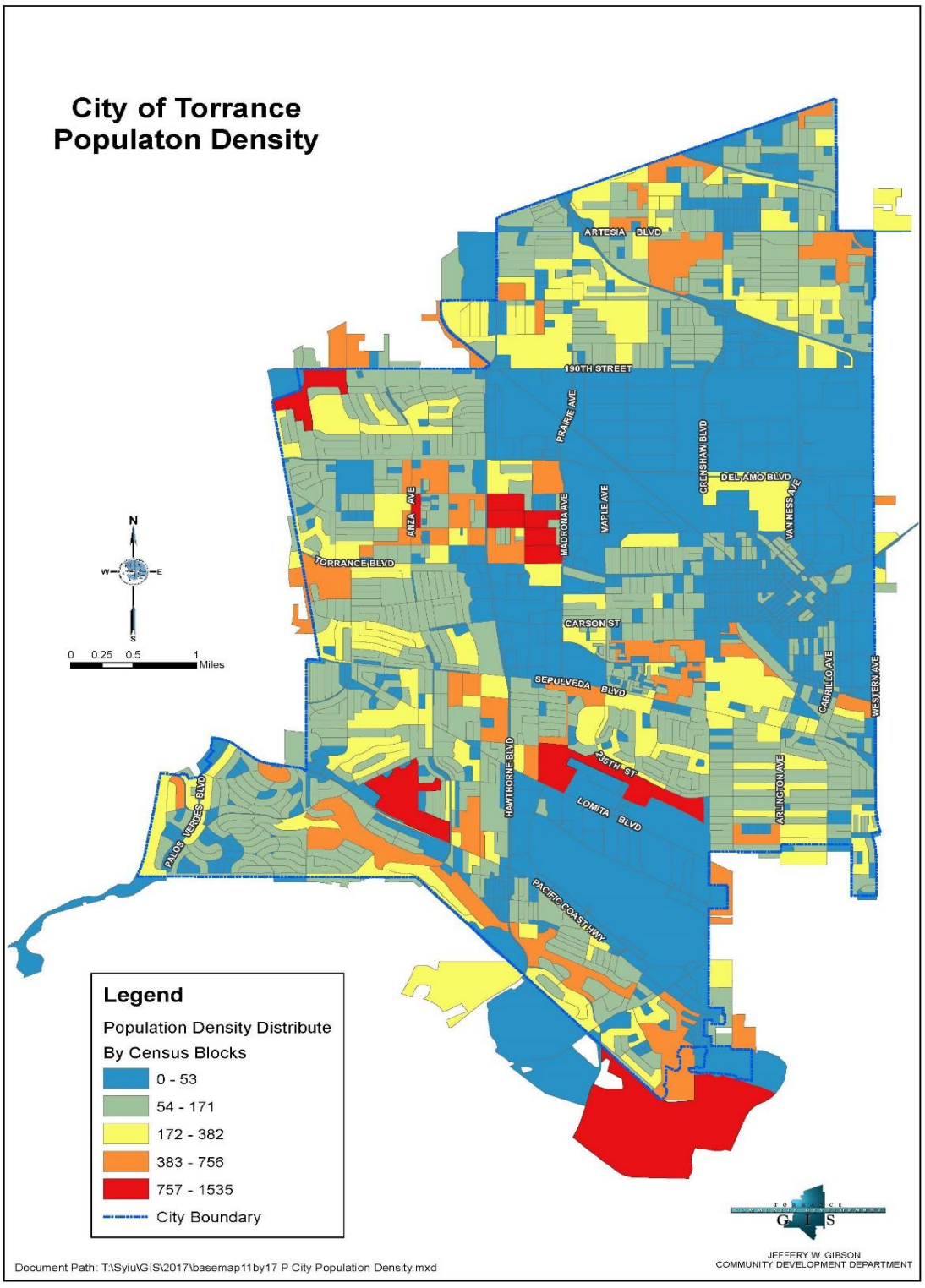


Figure 7: City of Torrance, Population Density

Ethnicity

As of 2010, 47.9% of Torrance residents identified as white. The second largest ethnic group identified as Asian at 37.10%. Hispanic or Latino persons of any race made up approximately 17% of Torrance residents. Based upon census data from 2010, ESRI modeling does not predict the ethnicity make up to change more than 2% for any ethnicity in Torrance. According to Torrance Unified School District, there are over 80 different dialects spoken in Torrance.

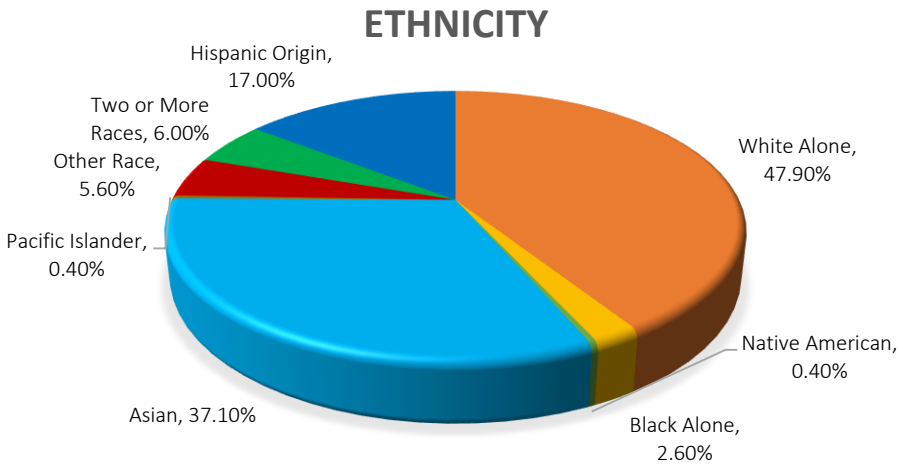


Figure 8: Ethnicity Source: 2010 US Census Bureau

Housing Summary

It is estimated by the American Community Survey (ESRI Report) conducted in 2015 that Torrance has a total of 58,643 housing units. Detached single family homes account for the majority of housing units at 54.2% with a total of 31,785 units. Single family attached homes account for 6.8% of the housing units with a total of 3,974 units. Multi-unit housing of 20 or more account for 22.8% of the housing units with a total of 13,392 units. The remainder of the housing units are multifamily units below 20 or mobile homes.

Only 9% of the housing units were built prior to 1949. Torrance experienced a housing boom from 1950-1979 when 74.5% of the housing units were built. Since 1980, Torrance has added 16.5% of its current estimated housing unit. Torrance, like most of California is experiencing a shortage of affordable housing resulting in some businesses choosing to leave the state for more affordable housing for their workforce. Additionally, Torrance is generally considered a "built out" city with very little room for new housing. In order to meet the demand for housing with a lack of new property to build upon, high and moderate density housing projects are being proposed by developers. Currently changing single family residential properties or rezoning non-residential properties for high density housing is met with strong resistance from the community. This is a trend TFD will monitor due to the potential increase for services as the population grows.

Hospitals

There are two state of the art hospitals located in Torrance. Torrance Memorial Medical Center was the South Bay's first hospital, founded by Jared Sidney Torrance in 1925. Torrance Memorial is a fully accredited, full-service, 446-bed, nonprofit community medical center. Torrance Memorial is a pioneer in prevention, education and community services, serving more than 30,000 people per year. Little Company of Mary is a non-profit, 317-bed hospital dedicated to meeting the healthcare needs of the community. Little Company of Mary is a member of the Providence Health System and is a premier provider of comprehensive medical and health services. The hospital provides the latest techniques in invasive and non-invasive cardiac procedures and comprehensive cardiac rehabilitation services. Both of the hospitals have emergency departments that receive patients as a result of "911" services.

Business Summary

Torrance has transitioned from its original industrial city concept into a diverse business community. The largest employment sector is the services industry which includes hotels & lodging, automotive services, health care, legal services, and education. Torrance is expanding and leading the way in the region in the health care industry. The retail trade sector makes up almost 20% of the business community and includes home improvement, general merchandise stores, food stores, auto dealers, apparel, furnishing stores, and eating and drinking establishments. The third largest sector are finance, insurance, and real estate related businesses accounting for 11.4% of the businesses in Torrance. The graph below represents a summary of all business sectors according to the Standard Industrial Classification Codes.

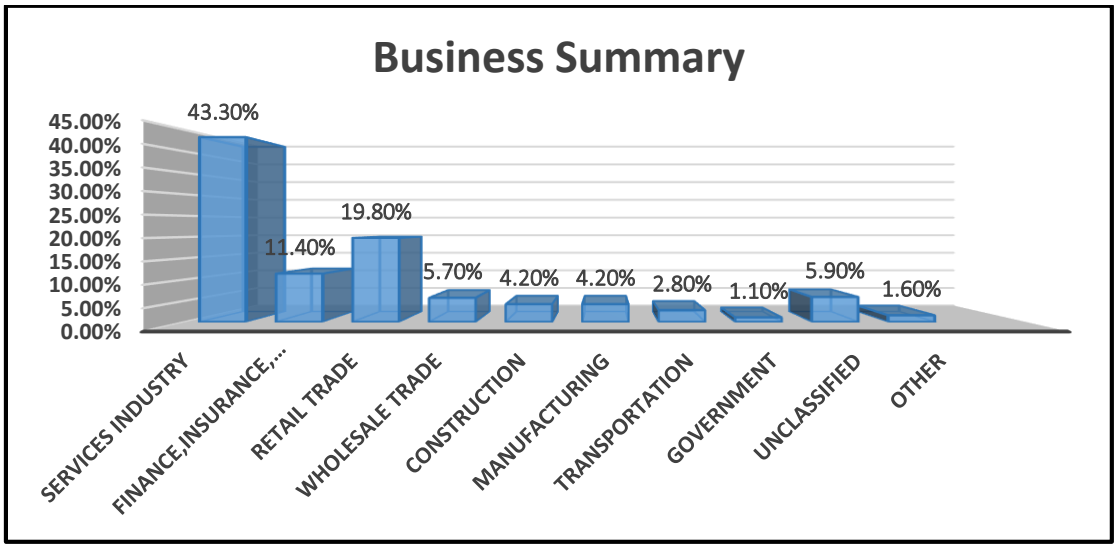


Figure 9: Business Summary Source: American Community Survey (ESRI Report) 2015

Governance

The City of Torrance is a Charter City governed as a Council/Manager form of government. The City Council is comprised of the Mayor who is elected at-large and six City Council members who historically been elected at large by registered voters of the City; however, in June 2018 the City Council approved an ordinance implementing "by-district" elections for all future council seats. The Mayor and Councilmembers each serve a four-year term. The City of Torrance has a two-term limit for the City Council. The City Clerk

and City Treasurer are elected every four years and do not have term limits. Elections are held every two years, on the even year.

In the Council/Manager form of government, the City Council, as the elected body, adopts legislation, sets policy, adjudicates issues and establishes the budget of the City. The City Council appoints the City Manager and the City Attorney. The City Manager is charged with the duty of implementing City Council policy and laws as the administering head of the government. The City Council appoints volunteers to serve on various advisory boards, commissions and committees. Councilmembers and the Mayor may serve as representatives on intergovernmental and regional boards, commissions and committees as part of their elected capacity. Councilmembers and the Mayor are directly accountable to the electorate and must constantly balance the views of individuals and groups with the needs of the entire community.

City Budget

The City's total revenues of $301.1 million were derived from the following: Twenty eight percent (28%) of the program revenues is derived from fees charged for services; ten percent (10%) from utility users' tax; eleven percent (11%) from other taxes such as construction tax, occupancy tax, business license tax and franchise tax; seventeen percent (17%) from sales taxes; sixteen percent (16%) from property taxes; twelve percent (12%) from operating grants; two percent (2%) from capital grants; and four percent (4%) from other miscellaneous revenue fees. The graph below shows the revenues generated by the City in 2017.

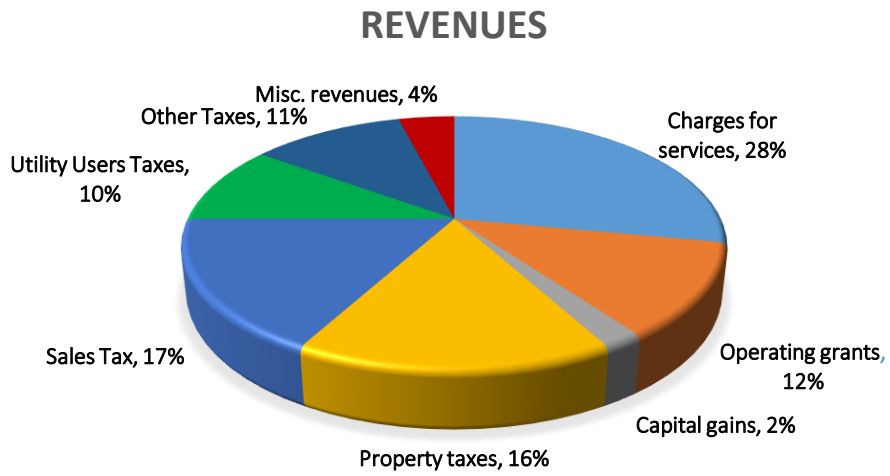


Figure 10: City Budget Source: City of Torrance 2017 Comprehensive Financial Report

The Department continuously monitors the City budget as impacts have a direct correlation to services. The rising pension cost is a major concern for the City of Torrance. TFD will need to be proactive in working collaboratively with all stakeholders to minimize the impacts of rising pension cost.

The City of Torrance spends thirty-seven percent (37%) of functional expenses related to public safety; ten percent (10%) relates to general government; nine percent (9%) to public works; six percent (6%) to culture and recreation; three percent (3%) to community development; one percent (1%) to interest on debt; and thirty-four percent (34%) to business-type activities. The graph below shows the percentage of funds spent on functional expenses.

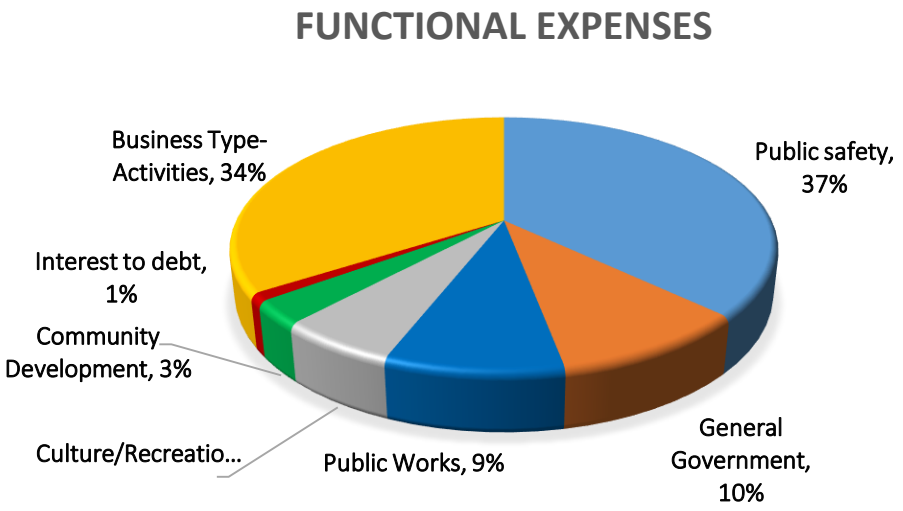


Figure 11: Functional Expenses Source: City of Torrance 2017 Comprehensive Financial Report

Regional and City Trends

TFD is closely monitoring the following regional and city trends and "hot button" topics that could result new risks and impact fire and EMS services:

- Oil refinery safety regulations and the impact on the Torrance Refining Company's ability to operate safely and efficiently.
- Repurposing of the former Toyota Campus. This is a large development that is located in an area that total response time benchmarks are not being met.
- Rising cost of the workforce.
- Increase in high density housing proposals.
- Regionalization of fire services. Mutual Aid Region 1, Area G originally included 9 cities. Today, only 4 cities remain and the closest (Redondo Beach) is requesting a proposal for fire and EMS services from Los Angeles County.

While the TFD does not have direct control over many of these issues, the Department realizes the impacts these issues can have on fire and EMS service in Torrance; therefore, it is essential to be proactively engaged with the "whole" community in order to serve the mission. TFD will continue to be active in community groups and work groups and will maintain relationships with city officials from all departments to ensure we work cooperatively to reduce risks.

Community Expectations

In developing the TFD 2018-2023 Strategic Plan, staff members met with community stakeholders to gather feedback and input on service delivery standards. As a result of community stakeholder meetings, community program priorities represented in the table below were established and incorporated into the strategic plan.

Programs	Ranking	Score
Emergency Medical Services	1	321
Fire Suppression	2	293
Hazardous Materials Mitigation	3	243
Rescue – Basic and Technical	4	234
Domestic Preparedness Planning and Response	5	223
Community Risk Reduction	6	126
Public Fire and Life Safety Education	7	104
Fire Investigation	8	80

Figure 12: Community Program Priorities Source: TFD Strategic Plan

Figure 13: Internal Stakeholder Team Source: TFD Strategic Plan

Torrance Fire Department Strategic Initiatives

As a result of the TFD strategic planning effort conducted in the 4th quarter of 2017, the department developed 8 strategic initiatives that are included in the 2018-2023 Strategic Plan.

Torrance Fire Department Strategic Initiatives

Strategic Initiative 1-Accreditation
Prepare for, pursue, achieve and maintain accreditation from the Commission on Fire Accreditation International to measure and improve the quality of all aspects of TFD service delivery.

Strategic Initiative 2-Community Involvement
Adopt the whole community approach to fire and emergency services through positive community relationships, marketing the value of our services, and connecting with our customers to reduce risks and produce safe and effective incident outcomes.

Strategic Initiative 3- Information Technology
Identify, obtain, and utilize emerging information technologies and data management systems to improve department efficiencies, improve communications, reduce community risks and provide more effective response to all-risk emergencies.

Strategic Initiative 4- Emergency Medical Services (EMS)
Build upon our current data-driven and evidence based system to enhance EMS delivery through an innovative, adaptable, and more robust service delivery model focused on caring for better patient outcomes as our top priority.

Strategic Initiative 5-Personnel/Workforce Development
Attract, develop, and retain employees capable of meeting today's demands and leading the organization into a rapidly changing future in order to provide relevant and sustainable services to the community.

Strategic Initiative 6-Physical Resources
Develop and implement a physical resource plan to ensure the workforce is provided with contemporary facilities, reliable apparatus and equipment to execute the department mission.

Strategic Initiative 7- Health and Wellness
Develop, foster, and enhance the safety, health, and wellness program to reduce the negative impacts of occupational-related disease and injury.

Strategic Initiative 8- Training and Education
Develop, measure, and enhance the TFD training and education program to ensure the workforce is capable of responding to routine and high-risk/low-frequency emergencies that often result from emergency requests for service.

Figure 14: TFD Strategic Initiative, Source: 2018-2023 Strategic Plan

Section 2 - Fire Department Overview

Mission Statement

We are a unified department - honored to serve our community through proactive emergency response, risk reduction, and community engagement.

Vision

We strive to be a progressive, community-based fire and emergency service department that is responsive to the needs of all stakeholders. We are committed to continuous self-assessment and quality improvement. We will actively seek opportunities to engage our community members with the understanding that we are role models both on and off duty. Working alongside other City departments, we will have an open and transparent relationship with our citizens, with a focus on improving their quality of life. We will leverage technology to help reduce the risk of an emergency and take a proactive stance, as opposed to a reactive posture. We will invest in the next generation of firefighters by providing a high level of professional development- this will ensure they are prepared for the future challenges facing our profession.

Values

Responsiveness- We answer every call to serve—emergency or otherwise—as quickly and safely as possible.

Duty- We take ownership of our actions on and off duty. We serve the needs of others before our own interests.

Excellence- Average is unacceptable. From our appearance, to our conduct, to our work, we aspire to become experts in our profession.

Integrity- Trust is critical to our mission. We do the right thing, not the easy one.

Teamwork- We treat residents, businesses, and City departments as our partners to help keep our community safe. We are better when we work together.

Communication- Words matter. We communicate respectfully and productively with each other and with our community. We invite and seriously consider any ideas or suggestions—from any level, internal or external—that will make us better.

Compassion- We believe that every member of our community deserves to be treated with kindness, care, and respect.

TFD Motto

Desire to serve - Ability to perform - Courage to act

Figure 15: TFD Mission Statement, Vision, Value, and Motto Source: TFD Strategic Plan

Organizational Structure

The mission is the core of the organization and represents the TFD brand. The Fire Chief shall be the principal executive and administrative officer. The Deputy Fire Chief shall be the second principal executive and administrative officer.

Under the direction of the Fire Chief, each division within the Department shall be managed by an Assistant Chief or the Administrative Services Manager. Operations personnel from the rank Captain and below are assigned to work a 48/96 shift schedule. Each Assistant Chief is assigned one 24 platoon shift every sixth day to manage and lead as the Platoon Commander. Two Assistant Chiefs divide the supervisory duties of the Captains on their respective shift to ensure unity of command. Company Officers are to lead and manage their stations, apparatus, and members under their command.

All divisions led by Assistant Chiefs are designed to avoid organizational silos and increase the communications between divisions. The Administrative Division is unique because it is not staffed with safety personnel. In order to avoid an administrative management silo, the staff performs cross training within the division. In addition, the Administrative Division provides administrative support to all department divisions.

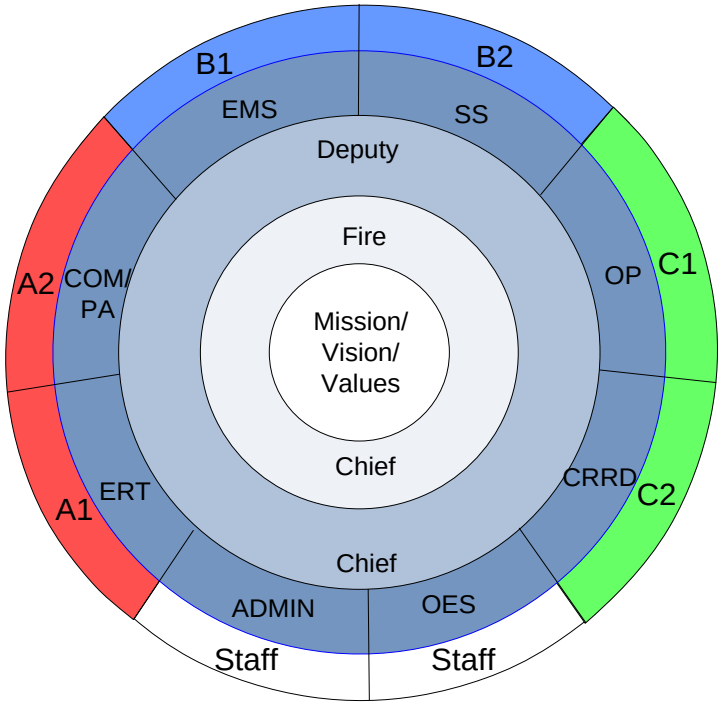


Figure 16: Organizational Structure Source: TFD Strategic Plan

Department Divisions

Administrative Division

The Administrative Division creates a foundation for continuous quality improvement, cohesiveness, and dedication to the betterment of the department by providing leadership, support, and management of administrative functions. The division coordinates department efforts relating to the following City departments: Human Resources, Risk Management, City Attorney, Finance, and the City Manager's Office. The Administrative Division plays a vital role in data management and analysis, accreditation, city processes, and supporting other divisions with clerical support when needed.

Communications and Public Affairs Division

The Communications and Public Affairs Division provides leadership and management on projects and assignments that are designed to keep the public and other agencies informed about the Torrance Fire Department. These divisional responsibilities include serving as the TFD Public Information Officer, media relations, education and community outreach, legislative affairs, multi-media services, future firefighter development, and communications.

Community Risk Reduction Division

The Community Risk Reduction Division provides leadership and management of risk reduction and fire prevention functions of the department. The division applies life safety codes to new and existing structures, provides plan checks, performs fire investigation, and oversees hazardous material administration. The divisional responsibilities include the tracking and implementation of changes in law that affect risk reduction and coordination of all risk reduction efforts related to fire, hazardous materials, and code enforcement.

Emergency Medical Services Division

The Emergency Medical Services (EMS) Division provides leadership and management of the EMS program. The division tracks and implements EMS mandates and training of firefighters and paramedics who provide medical care. The divisional responsibilities include the management of the Continuous Quality Improvement program related to EMS, medical supply stock tracking and ordering, providing EMS training, and coordination with outside vendors and agencies related to the EMS program.

Emergency Response and Training Division

The Emergency Operations and Training Division provides leadership, direction and training for fire suppression, hazardous materials, technical rescue, specialized emergency response programs, and health and wellness programs. The divisional responsibilities include implementation of strategies to meet training mandates and enhancement of the capabilities and skills of all safety members within the department.

Organizational Planning Division

The Organizational Planning Division provides leadership and management of workforce/employee development, the Incident Safety Officer program, succession planning efforts, and performance improvement efforts of the department. The divisional responsibilities include subject matter oversight on all promotional exams, strategic and advanced planning functions of TFD including deployment and resource modeling, analytics and statistical data review, strategic planning, and standards of cover.

Support Services Division

The Support Services Division provides leadership and management of the physical resources and information technology efforts of the department. The divisional responsibilities include purchasing and maintaining apparatus, equipment, and personal protective gear that is essential for safe and effective response to the community. Support Services is the primary TFD contact with the following City departments: General Services, Public Works, and Communications and Information Technology.

Office of Emergency Services

Emergency Services, in coordination, conjunction and collaboration with all City departments will maximize the City's potential to prevent against, prepare for, respond to and recover from both natural and man-made emergencies and disasters.

Leadership Commitments

In 2016, Company and Chief Officers worked cooperatively to develop the following leadership commitments during the annual officer meeting.

As leaders in the Torrance Fire Department, we have a commitment to:

- Recognize the importance of our mission, support & encourage one another, celebrate our successes at every opportunity, and remember the "Man in the Arena"
- Place the mission ahead of self-interests
- Create a positive & challenging work environment; base our actions on the Platinum Rule ("Treat others the way THEY want to be treated")
- Demonstrate technical and operational competence at every opportunity; set the example for exceptional customer service
- Be better listeners; transparent in all communication, keeping team members informed; respect and value the opinion of others, regardless of rank & seniority
- Learn from our mistakes, hold ourselves and our crews accountable for every action; take ownership of our actions
- Develop our leaders through regular coaching, mentoring, succession planning, and continuous improvement; value all aspects of the wellness of our team members (physical, spiritual, fitness, family, health, etc.)
- Proactively engage our community and stakeholders, seeking every opportunity to tell the Department's story
- Be standard-bearers and role models of integrity & excellence, walking the talk and living our respective leadership philosophies

Figure 17: Leadership Commitments Source: TFD Strategic Plan

Department History

On the night of November 12, 1912, local businessmen met at the tent belonging to D.W. Gregory, the general foreman for the Dominguez Land Company. These men felt that protection from fire was of prime importance to this new community. At 8:00 p.m. that evening, the businessmen and residents established the Torrance Volunteer Fire Department. The first men to sign the roll of the membership were Harry McManus, elected as chief; Al Kirby, hose man; O.M. Erickson, hydrant man; George Blake, hose man; Charles Callahan, hydrant man; and D.W. Gregory for a total of seven men. Within two days the ranks had swelled to 40 men. The Chamber of Commerce would act as an advisory board to this new service until the city was incorporated.

During the early years, the old fire company grew as the city attracted more residents. The Torrance Volunteer Fire Department was also a social group and it was quite prestigious to belong to it.

The first equipment used by the Volunteer Fire Company was a two-wheeled hose cart with a couple hundred feet of hose, some nozzles, axes and soda-acid extinguishers. These were stored in a little, open shack on the north side of Carson Street where Andreo Avenue meets Carson. To sound alarm to the residents and the volunteers, a 5-foot diameter locomotive drive rim was acquired. When the alarm rang, the volunteers would show up, grab the ropes and handles of the hose cart and pull it to the fire. The first recorded fire was a haystack that burned on September 15, 1913.

Figure 18: TFD Volunteer Fire Company - Two Wheeled Hose Cart

Around 1916 the volunteers got an old, four wheeled buggy and converted it to carry ladders, axes, ropes, buckets, etc. for this "Hook and Ladder" company. The "Hook and Ladder" was also hand drawn and stored in the shed next to the hose cart. The first motorized apparatus for the department was a "Combination" Chemical and Hose Car mounted on a 1919 Model "T" Ford one-ton chassis, purchased from the American-La France Company, Los Angeles. Although the City had a volunteer fire department since 1912, the only legal documents that attest to their existence is in newspaper clippings and historic photos.

On May 12, 1921, the City of Torrance was incorporated and had its first Council meeting. One of the first orders of business was to establish a fire department. The City Council appointed Ben Hannebrink, who was the volunteer chief, as the new paid fire chief. The department was re-organized into a paid/call department and all of the approximately 20 former volunteers were now paid $7.50 a month and required to respond to all fires.

In 1922, the department purchased its first pumper, an American-La France Triple Combination Pumper with solid rubber tires, an 80-gallon chemical extinguisher and a hose reel. On November 8, 1922, the City bought property at Cravens and El Prado for $8,000.00. On this site, a combination firehouse, City Hall and jail was built at a cost of $13,262.18.

The 1920's were a time of growth. The size and nature of fires were also growing within the city. By 1926, an American-La France city service truck was purchased. With this new piece of apparatus, the department had again outgrown its quarters. A new fire station, with the City Hall upstairs, was built next door to the existing station addressed at 1523 Cravens.

Torrance continued to grow even during the depression years of the 1930's. The City Council met on December 30, 1930 to pass an ordinance to "provide for the formation, organization and regulation of the Torrance Fire Department." As adopted on the third day of March, 1931, "The Torrance Fire Department of the City of Torrance shall consist of a Chief Engineer, one Assistant Chief Engineer, and the present active members of the Torrance Volunteer Fire Department and such other officers and firemen as may be appointed hereinafter provided."

To provide fire protection for the southern part of town, two private garages were used to house the apparatus manned by the volunteers, or "call men." W.K. Adolph's garage in the Walteria section was home to the Model T Chemical engine, and the other garage was across the street from the Hollywood Riviera Beach Club. These garages were used until land was purchased at 242nd Street and Neece Avenue and Station #2 was built. Walteria resident and call man Percy Bennet built the station in 1934 for a cost of $1,113.33. A 1923 four cylinder American LaFrance pumper was then acquired from the City of Upland and manned by a two-man crew.

In 1938, the City created a Department of Public Safety, combining police and fire services under the direction of John Stroh. He was chief from December 1, 1938 until October 28, 1939 when the experiment was abandoned. During this short period, the Walteria Station acquired the adjoining lot for future expansion, and also had two phones installed, one at the station, the other at W.K. Adolph's garage. During the day, Adolph was in charge and at night, Lyle Sagel, one of the seven Walteria call men, slept at the station to receive alarms.

With the rumors of war in the early 1940's, Chief McMaster prepared the department. He convinced authorities that the "firemen" should be exempt from the draft due to the need for firemen to protect vital areas like San Pedro. Even though firemen became exempt from duty, over half the department enlisted. The department began hiring temporary replacements. Station 2, in the Walteria section, was cut back from two men to just one, and operated on a contract basis rather than a fully paid department.

With the end of the war, the firemen returned and the department went back to full time status. Station 2 was brought back up to two men and by 1948 a third man was added.

For fire protection in the north end of town, land was purchased in 1948 and a station was built at 3610 Artesia Blvd. The station was manned by one paid fireman and supplemented by several call men who were alerted by a roof top siren. Two 1949 Mack fire engines were purchased towards the end of the decade. One an open cab and the sister engine a closed cab.

The 1950's were again a time for expansion. The end of 1951 phased out the call men of the department. The Torrance Fire Department was now a fully staffed, fully paid, fire department consisting of 58 men.

On May 9, 1952, land was purchased for a new Headquarters Fire Station. The site was located at the town's edge in order to stay off the major streets. By September 12, 1955, the old downtown fire station was vacated and torn down. It had been in use for 20 years. The present day Headquarters building, located at the corner of Carson Street and Crenshaw Blvd., was dedicated on October 28, 1955. Station 3 on Artesia was enlarged in 1954 and Station 4, in the Hollywood Riviera, was constructed at the corners of Calle Mayor and Pacific Coast Highway in 1955.

Figure 19: Torrance Fire Department Headquarters - 1955

The 1960's brought with it new stations and rigs. Two new American La France 1250 gpm pumpers were purchased and delivered. On April 5, 1962 the Walteria Station was replaced by the current Station 2. It was built on airport property and housed an engine for residences and a Crash Unit to provide protection for airplanes fires as well. The training tower and drill grounds adjoining Station 2 would be completed and dedicated by March 16, 1964.

On January 1, 1964, the Torrance Fire Department, by City Council Ordinance No. 1447, went from a two platoon to a three platoon system. The staffing would grow from 82 firefighters in 1963 to 128 firefighters by 1965-66. In 1966, the department purchased another American La France engine, we now had three new engines. By November 1966, a 100' aerial ladder was added to the fleet.

Figure 20: Fire Call Box – 1966

In 1966, under the direction of Chief Benner, fire call boxes were introduced to Torrance. After 5 years of planning 38 call boxes were installed and connected to the dispatching center where they were under 24-hour monitoring.

In 1967, Station 5 on Del Amo Blvd. was built and dedicated, followed by the relocation of Station 3 to its current location on 182nd St.

Continuing to grow, The Torrance Fire Department put its first Paramedic unit into service in 1972. By December 1973 Paramedic calls accounted for 75% of all calls. By June 1974, the department added a second rescue. A third paramedic rescue unit was added in 1978.

On October 11, 1986, Fire Station 6 was built near the Del Amo Mall and the high-rise buildings of the

Financial District.

Figure 21: Hazardous Material Equipment – 1988

1988 and 89 saw the development and implementation of a state of the art Hazardous Materials Response Team. A forty foot fifth wheel trailer stocked with chemical protective clothing, air monitoring equipment, reference materials, a chemical analysis laboratory, patching and decontamination capabilities was assembled by Torrance Fire Department personnel. At the same time, State and Federal legislation pertaining to the storage and use of industrial chemicals created a new role for the department. The City Council passed resolutions designating the Torrance Fire Department as an "Administering Agency" for the implementation and management of these environmental laws in the City. The department became responsible for the review and verification of chemical inventories, and Business Plans and Risk Management and Prevention Plans submitted by businesses in the community. The Fire Department's database became the access point for the public's "right to know" about what chemicals are stored and used in the community. These new programs have resulted in a significant reduction in the risk associated with the use of chemicals. With the role of Administering Agency came the addition of new personnel who have specific expertise in chemistry and chemical process safety.

In 1991, TFD reorganized to create a separate Hazardous Materials Administrative Division. One of the duties of this division is to represent the City's interests in the implementation of a legal Consent Decree between the City and the Mobil Oil Corporation. The Consent Decree authorized a stem to stern safety evaluation of Mobil's refinery.

In the early 90's, TFD recognized a need to increase its expertise and capability in the field of Technical Rescue Services. Over a period of several years, significant enhancements in both training and equipment have resulted in the creation of a first class Tech Rescue Response Team. The Torrance Firefighters Association donated a heavy-duty trailer that was refurbished and specially equipped for this purpose. The department secured the use of an abandoned Nike missile silo at the Torrance Airport and converted it to a Technical Rescue Training Facility that has been certified by the State Fire Marshal's Office.

In 1995 the Torrance Fire Department received a rating as a Class 1 Fire Department by the Insurance Services Office (ISO). The ISO rates fire departments nationwide for their effectiveness.

Department Financial Basis

The financial basis for providing fire and EMS services is contained in the Fire Department Operating Budget and the Emergency Medical Services Enterprise Fund within the City's Operating Budget. The proposed 2017-18 Fire Department budget is $29,888,312 and the EMS Enterprise Fund is $12,854,007 for a combined total of $42,742,319. Salaries account for 93% of the expenditures from the fire department budget and 96% of the EMS Enterprise Fund. The graphs below show the percentage breakdown of the budget. In addition to the operating budget, the fire department has funding sources available in the City Capital Budget.

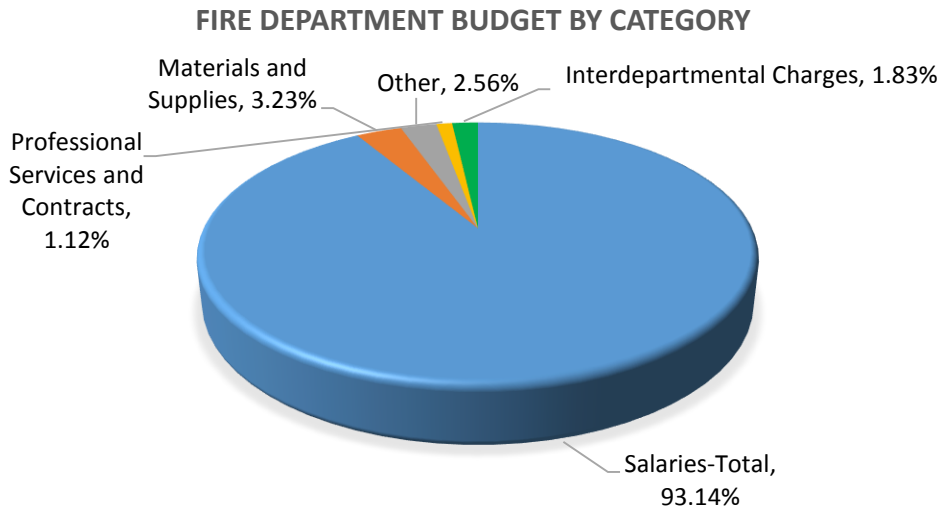


Figure 22:Fire Department Budget by Category Source: City of Torrance 2017-18 Proposed Operating Budget

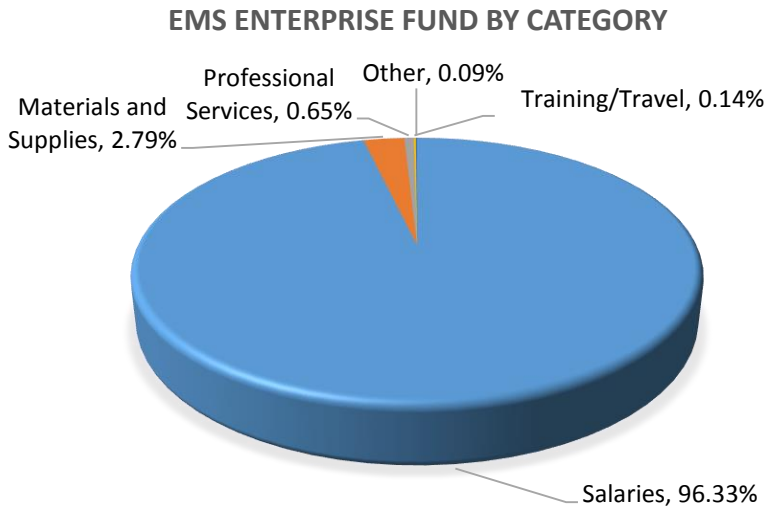


Figure 23:EMS Enterprise Fund by Category Source: City of Torrance 2017-18 Proposed Operating Budget

Insurance Services Office (ISO) Rating

The Insurance Services Office (ISO) property class rating is important to a community. Many insurance companies base the fire risk portion of property insurance premiums on the community's ISO rating. ISO uses a 1 to 10 rating scale, with Class 1 being the best level of service (and lowest fire insurance premium cost) and Class 10 representing no service at all. ISO last surveyed TFD in February of 2018 and the department was able to maintain an ISO Class 1 rating. A rating breakdown of the most recent TFD ISO survey is shown in the table below.

Summary Evaluation

ISO Criteria	Actual	Maximum
Communication-Receiving and Handling Alarms	9.54	10
Water Supply	36.70	40
Fire Department Credible Points	46.29	50
Divergent Reduction (Community Risk Reduction Programs)	4.83	5.5
Total Credible Points	97.19	105.5

Figure 24: TFD ISO Survey Summary Evaluation Source: Insurance Services Office Property Class Rating

Torrance received a total credit of 97.19 points out of a possible 105.5. The fire department section of the Fire Suppression Rating Schedule (FSRS) reviews engine and ladder-service companies, equipment carried, response to fires, training and number of available firefighters. The following table is a detailed breakdown of the classification details assigned to TFD as a result of the ISO survey conducted in February of 2018.

Fire Department Classification	Actual	Maximum
Engine Companies	5.90	6
Reserve Pumpers	.49	.5
Pump Capacity	3.0	3
Ladder-Service Companies	3.85	4
Reserve ladder-Service Companies	.48	.5
Deployment analysis	7.96	10
Company Personnel	14.06	15
Training	8.55	9
Credit for Optional Considerations	2.0	2.0
Total	46.29	50

Figure 25: Fire Dept. Classification Source: Insurance Services Office Property Class Rating

Operational Coverage

The TFD's operations personnel work a 56-hour schedule and staff 14 "front line" apparatus and one platoon commander unit. The operations personnel work the 48/96, 3 platoon shift schedule. TFD personnel staff 7 engines, 2 tiller operated trucks, 5 paramedic rescues, and a platoon commander vehicle 24 hours a day, 365 days a year. Daily operations staffing is 46 personnel at all times.

All of these apparatus and units are named using standardized resource identification and numbering system consistent with California Mutual Aid, Region 1, Area G criteria. All TFD apparatus numbers begin with the number "9" to represent Torrance within Area G, followed by the station number they are assigned to. For example, E91 is a Torrance Engine from station 1. The one unique numeric indicator is E97 which is the second engine assigned at Fire Station 1.

The TFD's frontline apparatus and unit resources, including minimum staffing is listed in the table below:

Apparatus	Staffing
Engine 91	4 Person
Engine 92	4 Person
Engine 93	4 Person
Engine 94	4 Person
Engine 95	4 Person
Engine 96	4 Person
Engine 97	4 Person
Truck 91	4 Person
Truck 96	3 Person
Rescue 91	2 Person
Rescue 93	2 Person
Rescue 94	2 Person
Rescue 95	2 Person
Rescue 96	2 Person
B91	1 Person
Total	46 Personnel

Figure 26: TFD Apparatus Listing and Staffing

The TFD also has numerous unstaffed and reserve units including a technical rescue vehicle, a hazardous materials response vehicle, 2 foam units, and utility vehicles.

Fire Station 1- Headquarters
1701 Crenshaw Boulevard

Figure 27: Fire Station HQ

Built in 1955, Station 1 is the oldest fire station in the city and is the location of the Torrance Fire Department Headquarters. Fire administration and civilian employees working for the department are housed at Station 1. There are 15 sworn response personnel on duty each day. Members of the department's auxiliary and explorer programs report to Station 1 for their shifts and training. Station 1 units respond to a variety of occupancies including industrial, commercial and residential.

Frontline Apparatus	Make	Model	Year	GPM
Battalion 91	Chevrolet	Suburban	2009	-
Truck 91	Pierce	Tiller Truck	2001	1000
Engine 91	Seagrave	Triple Combination Pumper	2006	1500
Engine 97	Pierce	Triple Combination Pumper	2016	1500
Rescue 91	International	Terrastar Rescue Ambulance	2014	-

Reserve Apparatus	Make	Model	Year	GPM
Battalion 92	Chevrolet	Suburban	2002	-
Battalion 93	Toyota	Tundra	2001	-
Truck 913	Seagrave	Tiller Truck	1994	1000
Other Apparatus	**Make**	**Model**	**Year**	**GPM**
Utility 91	Ford	F350	2005	-
Utility 92	Ford	Van	2010	-

Figure 28: Station 1 Apparatus Listing

Fire Station 2

25135 Robinson Way

Figure 29: Fire Station 2

Station 2 was built in 1962. There are 4 sworn response personnel on duty each day. Station 2 is the training ground for all fire department personnel. The training tower and the department's recruit academy are held in the classroom at this location along with community CERT and BERT certification courses. Fire engine pump testing is performed here utilizing the drafting pit.

Frontline Apparatus	Make	Model	Year	GPM
Engine 92	Pierce	Triple Combination Pumper	2017	1500

Reserve Apparatus	Make	Model	Year	GPM
Engine 912	Seagrave	Triple Combination Pumper	1997	1500

Figure 30: Fire Station 2 Apparatus Listing

Fire Station 3

3535 West 182 Street

Figure 31: Fire Station 3

Station 3 was built in 1973. There are 6 sworn response personnel on duty every day. This is a brush station and responds with Area G strike teams to brush and wildland fires. Station 3 is also first-in to Torrance Refining Company. All paramedics at this station are members of the department's Tactical Emergency Medical Services team, and train regularly with the Torrance Police Department SWAT team.

Frontline Apparatus	Make	Model	Year	GPM
Engine 93	Pierce	Triple Combination Pumper	2014	1500
Rescue 93	International	Terrastar Rescue Ambulance	2014	-

Reserve Apparatus	Make	Model	Year	GPM
Engine 913	Seagrave	Triple Combination Pumper	2003	1500
Engine 916	Seagrave	Triple Combination Pumper	2003	1500

Figure 32: Fire Station 3 Apparatus Listing

Fire Station 4

5205 Calle Mayor

Figure 33: Fire Station 4

Station 4 was built in 1955. There are 6 sworn response personnel on duty each day. This is a brush station and responds to immediate need requests within the region. Additionally, E94 responds with Area G partners when strike team requests are received through the State mutual aid system. Paramedic personnel assigned to Station 4 are EMT instructors for the department.

Frontline Apparatus	Make	Model	Year	GPM
Engine 94	Pierce	Triple Combination Pumper	2014	1500
Rescue 94	Ford	F450	2006	-

Reserve Apparatus	Make	Model	Year	GPM
Engine 914	Seagrave	Triple Combination Pumper	1998	1500
Rescue 914	Ford	F350	2000	-

Figure 34: Fire Station 4 Apparatus Listing

Fire Station 5
3940 Del Amo Boulevard

Figure 35: Fire Station 5

Station 5 was built in 1967. At this station, there are 6 sworn response personnel on duty every day. Station 5 is home to a portion of the HAZMAT Team and R95. This station manages the entire TFD inventory of EMS equipment for the department.

Frontline Apparatus	*Make*	*Model*	*Year*	*GPM*
Engine 95	*Pierce*	*Triple Combination Pumper*	*2017*	*1500*
Rescue 95	*Ford*	*F450*	*2007*	-
Foam 95	Ford	F450 Utility	2000	-

Reserve Apparatus	Make	Model	Year	GPM
Engine 915	Seagrave	Triple Combination Pumper	2003	1500
Rescue 915	Ford	F450	2006	-

Figure 36: Fire Station 5 Apparatus Listing

Fire Station 6

21401 Del Amo Circle

Figure 37: Fire Station 6

Station 6 was built in 1986. There are 9 sworn response personnel on duty each day. Members of the HAZMAT team are assigned here in addition to the members at Station 5. This station is in charge of cleaning turnouts after structure fires, managing SCBA maintenance and repair, and USAR training and response.

Frontline Apparatus	Make	Model	Year	GPM
Truck 96	Pierce	Tiller Truck	2013	1000
Engine 96	Seagrave	Triple Combination Pumper	2006	1500
Rescue 96	Ford	F450	2005	-
USAR 96	International	Utility	2000	-
Air and Lighting	Freightliner	FL-106	1999	-
Foam 96	Ford	F450 Utility	2000	-

Figure 38: Fire Station 6 Apparatus Listing

Department Programs and Services

Community Risk Reduction Program

The Torrance Fire Department Community Risk Reduction Division (CRRD) is managed by an Assistant Chief. The CRRD engages in a full spectrum of services for the community. They range from answering simple fire safety questions for the general public to more complex fire protection concerns serving the business community. TFD personnel provide technical guidance to businesses on how to maintain a "code compliant" operation while fostering a “business friendly” environment.

CRRD duties include, but not limited to, providing fire safety information and assistance to professional designers, contractors, our city planners, commissioners and other city staff about new and existing projects within Torrance; review and approve new construction plans for compliance of life safety and fire protection regulations , water supply for fire protection systems and suppression operations and emergency vehicle/personnel access; and investigate fires occurring within the city to determine their cause and origin.

The Torrance Fire Department conducts approximately 9,000 annual life safety inspections of various occupancies based on adopted codes. Some of these occupancies include businesses, schools, hospitals, convalescent homes, day care facilities, residential complexes, industrial facilities and high-rise structures. Additionally, TFD conducts life safety inspections for special events, such as displays in common areas at mall functions, fundraising fairs, carnivals at local schools, film shoots, and big gala events. Inspectors look for obvious and sometimes not so obvious violations in the maintenance of life safety provisions for the building or the special event. Violations may include keeping exits clear or providing the proper type of fire extinguisher.

TFD issues operational permits for certain activities, practices or operations that have been determined by the Fire Code or the Fire Chief closer review to ensure compliance with current adopted life safety codes. These permits are issued by the CRRD. Some of these activities include:

- Public displays at the mall
- Carnivals and fairs
- Use and storage of flammable liquids
- Operation of a public assembly
- Open flames in public areas
- Installation or removal of underground fuel tanks and above ground fuel tanks
- Tents where the public is invited
- Use or storage of hazardous materials
- Welding
- Repair garages
- Christmas tree lots
- Installation of fire protection systems, including fire sprinklers and fire alarm systems

National Pollutant Discharge Elimination System (NPDES)

TFD is mandated by the Federal Clean Water Act (amended 1972) to implement the National Pollutant Discharge Elimination System (NPDES) program. This authorizes states and local jurisdictions the issuance

of permits to businesses that have the potential to release pollutants into local waterways. Additionally, the City of Torrance is required by NPDES to inspect these commercial and industrial facilities ensuring "Best Management Practices" are adhered to. The purpose is to prevent dangerous pollutants from entering the city's storm drain system either by rain water or non-rain water from these facilities. Inspections are conducted on a biennial basis and are managed by the CRRD Assistant Chief. To effectively and efficiently perform inspections, they are divided into the following categories: Commercial/Industrial Businesses, Automotive Facilities, Restaurants and Nurseries. Lastly, a Clean Bay Certification is given to those establishments that are proactively preventing pollution of beaches and the ocean.

Disaster Preparedness Program

In January of 2018, TFD assumed responsibility of the City of Torrance Office of Emergency Services for the entire city. Prior to the change, the program was administered by the Torrance Police Department. The Disaster Preparedness program is managed by the Deputy Fire Chief. The City has contingency plans in place in the case of facilities issues, equipment problems, staffing, and/or communication failures as a result of a disaster.

TFD conducts annual Mass Casualty Incident (MCI) training scenarios to prepare for those events with many injured persons. During a disaster, it is assumed that there will be many "normal" types of incidents that need a response, happening at the same time. The TFD has a robust training schedule that prepares us to respond to all types of incidents. All on duty personnel conduct various types of training on a daily basis.

In the event of a large scale disaster, resources in the area may become overwhelmed and depleted, which may hinder timely response and resources available. To help deal with these large scale incidents, the City of Torrance participates in the statewide mutual aid system. Torrance is part of Area G, Region 1 in the mutual aid system. In the event our resources are overwhelmed, the mutual aid system is activated to provide needed resources from our neighboring local agencies, and eventually other regions within the state, if needed.

In 2017, Torrance introduced its Local Hazard Mitigation Plan (LHMP). The LHMP outlines the City's potential for all types of natural or man-made disasters. Using this information allows the City to evaluate risk within the City, and its capability to mitigate such incidents. The LHMP was adopted by the City Council and approved by FEMA in December 2017.

In a large scale disaster, the City opens its Emergency Operations Center (EOC). Management from all City departments are represented in the EOC to aid in the management of the incident. In accordance with the 2017 edition of the State of California Emergency Plan (SEP) published on 10/01/17, Cal OES is changing our State Activation Level sequence to align with the Federal Emergency Management Agency (FEMA) and many of our local partners. The new Activation Levels apply to the State Operation Center and the Inland, Coastal and Southern Regional Operations Centers.

- Level Three EOC Activation: Level Three is a minimum activation. This level may be used for situations which initially only require a few people, e.g., a short term earthquake prediction at level one or two; alerts of storms, or tsunamis; or monitoring of a low-risk planned event. At a minimum, Level Three staffing consists of the EOC Director, Section Coordinators, and a situation assessment activity in the Planning and Intelligence Section. Other members of the organization could also be

part of this level of activation e.g., the Communications Unit from the Logistics Section, or an Information Officer.

- Level Two EOC Activation: Level Two activation is normally achieved as an increase from Level Three or a decrease from Level One. This activation level is used for emergencies or planned events that would require more than a minimum staff but would not call for a full activation of all organization elements, or less than full staffing. The EOC Director, in conjunction with the General Staff, will determine the required level of continued activation under Level Two, and demobilize functions or add additional staff to functions as necessary based upon event considerations. Representatives to the EOC from other agencies or jurisdictions may be required under Level Two to support functional area activations.
- Level One EOC Activation: Level One activation involves a complete and full activation of all organizational elements at full staffing and all Emergency Support Functions. Level One would normally be the initial activation during any major emergency requiring extreme State level help.

To help prepare the community, the TFD holds multiple Community Emergency Response Team (CERT), and Business Emergency Response Team (BERT) classes annually. Residents and employees of local companies are encouraged to take these courses to be prepared to help themselves and their community in the event of disaster. Over 1500 community members have been trained.

Emergency Medical Services Program

The Torrance Fire Department EMS program is managed by an Assistant Chief. Under his direction, the department also employs an EMS Coordinator that provides in house training, continuing education, and manages the EMS quality improvement program. The EMS Division is also assigned an EMS Captain to provide oversight to the EMT/Paramedic certification, recertification, EMS billing, EMS related training, and a variety of EMS program management tasks.

All firefighters in the City of Torrance are either emergency medical technicians or paramedics. TFD staffs 5 rescues, each with 2 paramedics 24 hours a day. These rescues are located at stations 1, 3, 4, 5, and 6. Fire station 2 does not have a rescue, therefore the engine company housed at station 2 (E-92), is a dedicated paramedic assessment engine. This allows E-92 to begin advanced life support measures until the arrival of the closest rescue. Many other engine companies carry advanced life support equipment when staffed with a paramedic to provide paramedic level of care to the community. All other engine and truck companies carry basic life support equipment. As a minimum, there are 11 paramedics on duty 24/7. Under normal conditions, most engine/truck companies are also staffed with at least 1 paramedic. In addition to the firefighter paramedics, many of our members that have promoted to Engineer or Captain maintain their paramedic certifications.

The Torrance Fire Department currently contracts with a private ambulance provider for patient transportation from the scene to the receiving hospital. These units are staged throughout the city for rapid response. The ambulances are staffed with 2 EMT's capable of providing BLS care.

Community Outreach and Communications Program

The Torrance Fire Department Community Outreach program is managed by an Assistant Chief. TFD is committed to community engagement and education. TFD engages with the local schools and provides Basic Aid Training to every 5th grader enrolled in the Torrance School District. In addition, tours of the fire stations are routinely scheduled with local schools. The Torrance Firefighters Association holds an annual bike safety rodeo for children in grades 3-5. TFD is also involved at the high school level by training every freshman student CPR through a cooperative agreement with Little Company of Mary Hospital.

In addition to local school outreach, TFD is committed to developing Community Emergency Response Teams (CERT) and Business Emergency Response Teams (BERT) for times of disaster. These teams are expected to fill in the low risk gaps when TFD resources are stretched thin during a major disaster such as an earthquake.

Additionally, TFD is actively engaged in the business community through fire extinguisher and basic safety training programs.

The following chart demonstrates the number of people reached by TFD personnel by safety program:

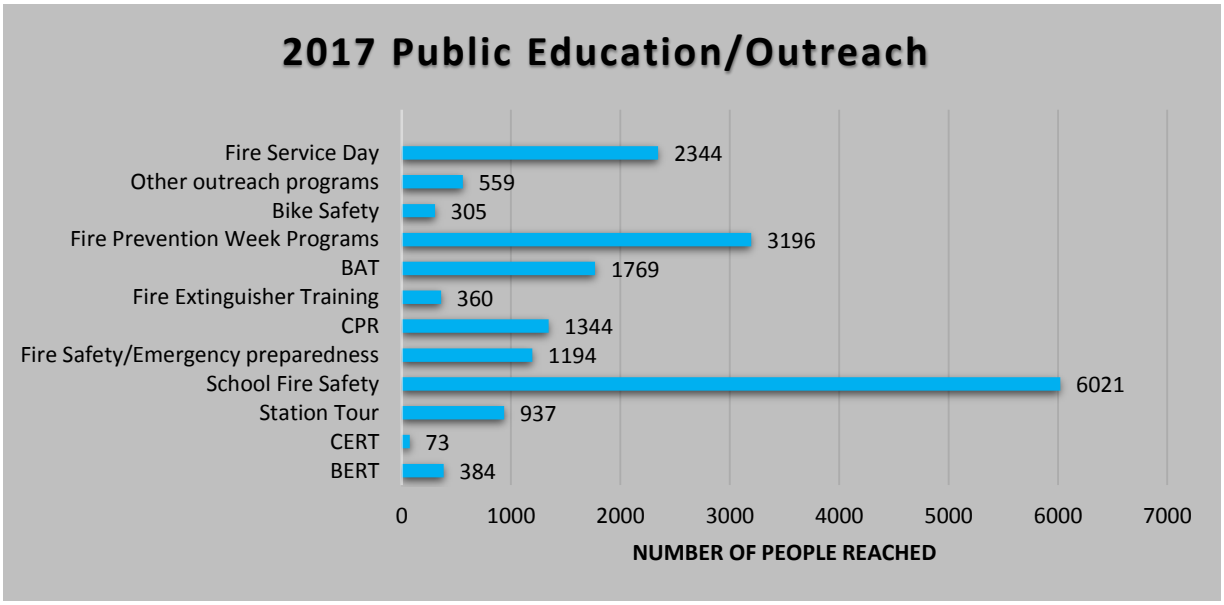


Figure 39: 2017 Public Education/Outreach

Technical Rescue Program

The Torrance Fire Department Technical Rescue program is managed by an Assistant Chief. Both TFD truck companies are equipped with basic equipment to perform rope rescue, vehicle extrication, elevator entrapments, etc. For a larger scale or a more complex emergency, the TFD has a well-equipped Urban Search and Rescue vehicle (USAR 96). USAR 96 is housed at station 6, and is cross staffed with truck company personnel when needed. All personnel that are permanently assigned to a truck company are trained in Rescue Systems 1 & 2, Trench Rescue, Confined Space Rescue, and Auto Extrication.

Members assigned to the truck companies conduct training exercises throughout the year to remain proficient and compliant with regulations. Frequent training in auto extrication is imperative to stay up to

date with the challenges faced in auto extrication with today's high tech vehicles. Members also participate in multiple challenging confines space rescue scenarios annually. Additionally, members annually review trench rescue, building shoring, and many rope rescue scenarios are performed.

The TFD has a technical rescue training site located at the east end of the airport property where countless scenarios above ground and below ground can be presented to the rescue teams. When practicable, training is conducted at other off site residential, commercial, and industrial facilities, which can each present unique challenges, and provide "real world" situations.

Hazardous Materials Response Program

The Torrance Fire Department Hazardous Materials program is managed by an Assistant Chief. The Torrance Fire Department is equipped to respond to and mitigate hazardous materials incidents within the city. A minimum of 5 State Certified Hazardous Material Specialists are on duty at all times assigned to E95 & E96. These engines carry special monitors to detect hazardous airborne chemicals in the event of an odor complaint or possible release. These members also cross staff Hazmat 96 (HM-96). HM-96 carries a combination of resources for investigating possible hazardous materials, and incident mitigation in the event of a hazardous materials release. This cache includes chemical identification kits, patches and plugs, chemical suits, decontamination equipment, etc. Along with their initial training, the Hazmat team follows an extensive training program. In a large scale incident, other agencies from neighboring communities may be utilized to augment our team. All other TFD personnel are state certified operations level personnel trained to respond in a defensive manner.

Fire Suppression Program

The Torrance Fire Department Fire Suppression program is managed by an Assistant Chief. The Torrance Fire Department is equipped to provide emergency response to a wide range of fire suppression incidents including structure fires, vehicle fires, dumpster fires, hazardous materials fires, brush fires, and wildland urban interface fires which occur on mutual aid deployments. The Department staffs with 7 front line fire engines with 4 personnel each capable of producing 1500 gpm at draft. Additionally, each engine company carries 500 gallons of water and a built in foam tank capable of producing aqueous film forming firefighting foam. The Department staffs 2 tiller operated trucks, one staffed with 3 personnel and the other with 4 personnel. Additionally, the Department staffs 5 two-person paramedic rescues. All TFD paramedics are trained firefighters capable of performing all engine and truck company tasks.

Aircraft Rescue Coverage

TFD Fire Station 2 is located directly adjacent to Zamperini Field (Torrance Municipal Airport). Station 2 houses a single triple combination pumper with a 500-gallon water tank, 40 gallons of foam, and is capable of delivering 1500 gpm. In addition, E92 is equipped with an FAA radio and aircraft rescue hand tools in the event of a plane crash. TFD personnel work and train closely with City airport personnel to ensure both departments are working cooperatively. The airport is not staffed 24 hours a day; therefore, TFD does have the ability to control the runway lights in the event an emergency occurs while the airport is closed. The airport does not sell jet fuel on site; therefore, a majority of the aircrafts are not jet operated.

Section 3- Community Risk Assessment

What is risk?

Definitions of "risk" can be found in a variety of publications, reports and other sources. One definition is: human behavior, systems malfunctions, or an event that results in an ignition or other detrimental incident leading to a negative impact to life, property and/or natural resources. Another simple definition is: the potential or likelihood of an emergency to occur. *(http://riskassessment.strategicfire.org/)*[40]

Risks that affect a community on a regular basis can be human-created or naturally occurring. Highly probable risk examples include emergency medical problems, fires contained to the room of origin, traffic accidents, and utility hazards. Examples of more infrequent risk might include terrorism, fires that result in the total destruction of a property, earthquakes, and major hazardous materials releases. A "risk assessment" simply asks, "How risky is the situation?"

What is Risk Management?

Risk management is the identification, evaluation, and prioritization of risks followed by a coordinated application of resources to mitigate, monitor, and control the probability and/or consequence of the event. The objective of risk management is to assure that uncertainty does not prevent the community or department from fulfilling its primary mission.

Community Risk Assessment

Community Risk Assessment is the identification of potential and likely risks within the community, and the process of prioritizing those risks. It is the critical initial step in emergency preparedness, which enables the TFD to eventually mitigate (if possible), plan, prepare and deploy appropriate resources to attain a desired outcome.

As of 2018, the development of a formal Community Risk Assessment document is new in the TFD; however, having a comprehensive Community Risk Reduction (CRR) focus is not a new concept for the department. The TFD has been actively involved in CRR for many years through life safety inspections, plan check, public education, hazardous materials inspections, emergency response, and other activities. While there is no specific blueprint for developing CRR plans in U.S. fire departments, there are some common and essential steps that the TFD has embraced. The TFD Community Risk Reduction Plan is specifically based on the types of risks and resources available in Torrance.

The TFD leadership recognizes that the TFD exists not only to respond to emergency incidents, but also to proactively prevent or mitigate the impact of such incidents within our community. The TFD is committed to a more *focused* approach to reducing specific risks. In addition, the team approach to CRR program must involve community partners, fire department members, and other staff, to truly result in an organizational culture that recognizes the importance of reducing risks within the community. It is critical that TFD leaders influence the entire organization to shift their thinking towards reducing and mitigating risks, as this is ultimately expected by the community and elected officials. This shift has begun; however, as with any organizational culture—particularly within the fire service—there tends to be substantial resistance to

change, and a strong investment in the old ways of doing things. It will be imperative that members embrace the department principle of Integrity "by doing the right thing, not the easy one".

Community Risk Assessment and Reduction Process

The Community Risk Assessment and Reduction Process is used to identify and prioritize local risks, followed by the integrated and strategic investment of resources (emergency response and prevention) to reduce their occurrence and impact. The TFD uses a six-step approach to assess and reduce risks in the City of Torrance.

- Step 1: Identify Risks
- Step 2: Prioritize Risks
- Step 3: Develop Strategies & Tactics to Mitigate Risks
- Step 4: Prepare Plan to Reduce Risks
- Step 5: Implement Plan to Reduce Risks
- Step 6: Monitor, Evaluate, and Modify the Community Risk Reduction Plan

Figure 41: Community Risk Assessment & Reduction Process

Risk Identification and Prioritization

The Torrance Fire Department risk assessment process utilizes a systematic methodology to identify and prioritize risks that are specific to the community. This process evaluates risk from two broad perspectives. First, risk is identified through analyses of historical community service demands. Second, community risk is evaluated by the specific hazard types and threats posed by those hazards.

The TFD community risk assessment identifies and prioritizes all of the community's unique hazards and risk factors. Hazards are the causes of harm in the community. Based upon historical incidents and known risks in within the city, the TFD classified hazards into the following categories: Fire, Emergency Medical Services (EMS), Hazardous Materials, Natural Hazards, Security Events, Utilities, and Technical Rescues. A risk is the probability, high or low, that any hazard will actually cause harm.

The TFD projects the necessary structure to allocate personnel, apparatus, and fire stations that provide the distribution and concentration of resources to mitigate those risks and meet the community's expectations. This methodology also provides information for the organization to consider alternative strategies to assist in the mitigation of risks. Hazards that had little quantitative data were evaluated through historical analysis in Torrance or other communities that experienced those types of events. For example, the historical effects of a major earthquake in Torrance are not clearly documented; however, Torrance has studied and prepared for the effects of a major earthquake based on the historical effects in other California communities.

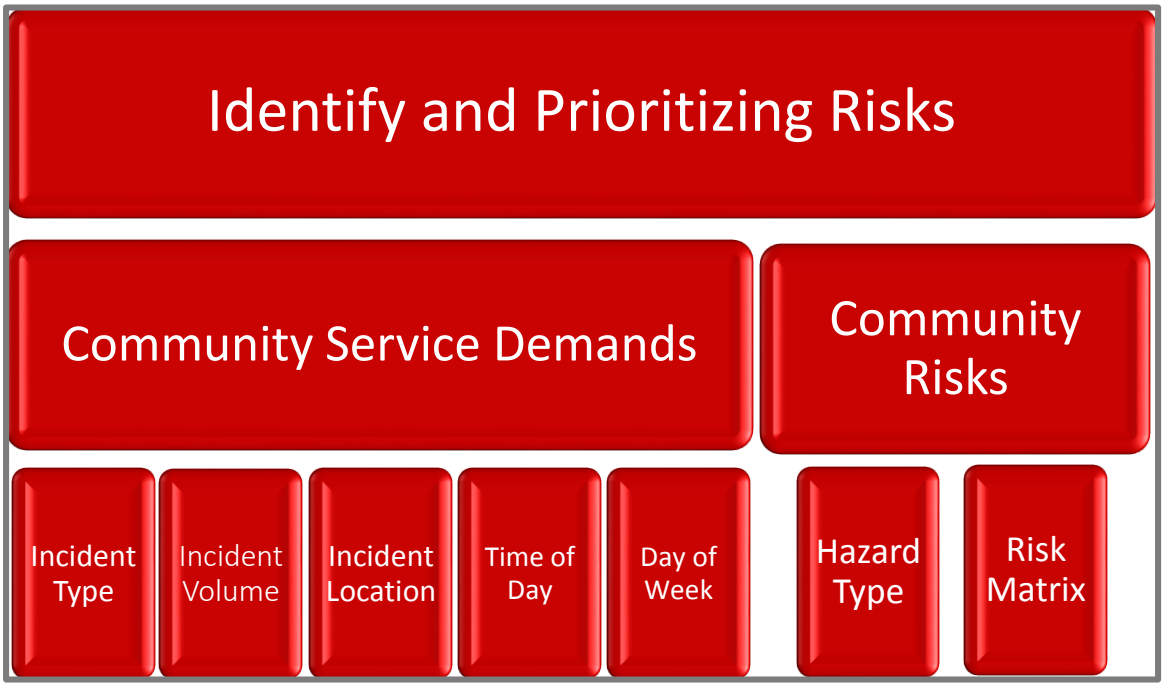


Figure 42 Risk Identification and Prioritization

Community Service Demands

Community service demands are analyzed by historical data on incident nature type, Incident volume, locations, time of day, and day of the week. Over the three-year period of 2015-2017, the TFD responded to a total of 44,552 requests for service, or dispatches including auto and mutual aid requests. The tables and figures below summarize the total responses. The service demands are shown in greater detail in the Geographical Planning Zones section of the Community Risk Assessment and Standards of Cover (CRA/SOC).

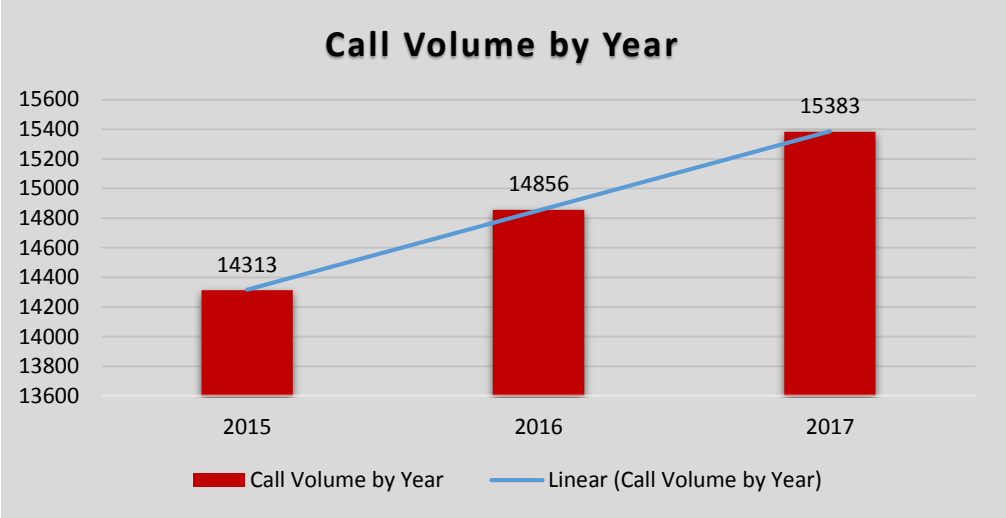


Figure 43: Call Volume by Year, Historical data from 2015-2017

Significant Finding

Call volume has increased by 6.94%, or 1070 calls, from 2015 compared to 2017

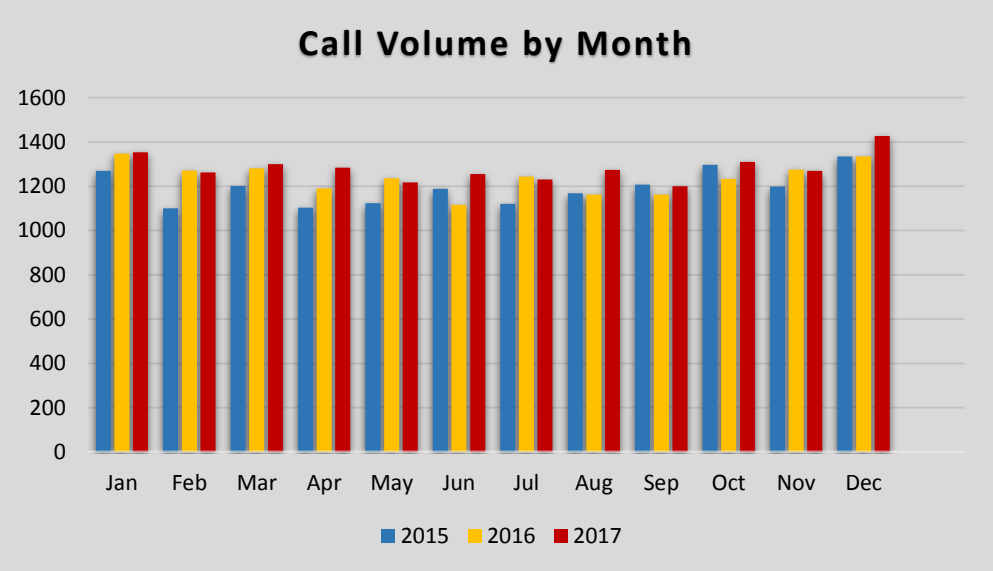
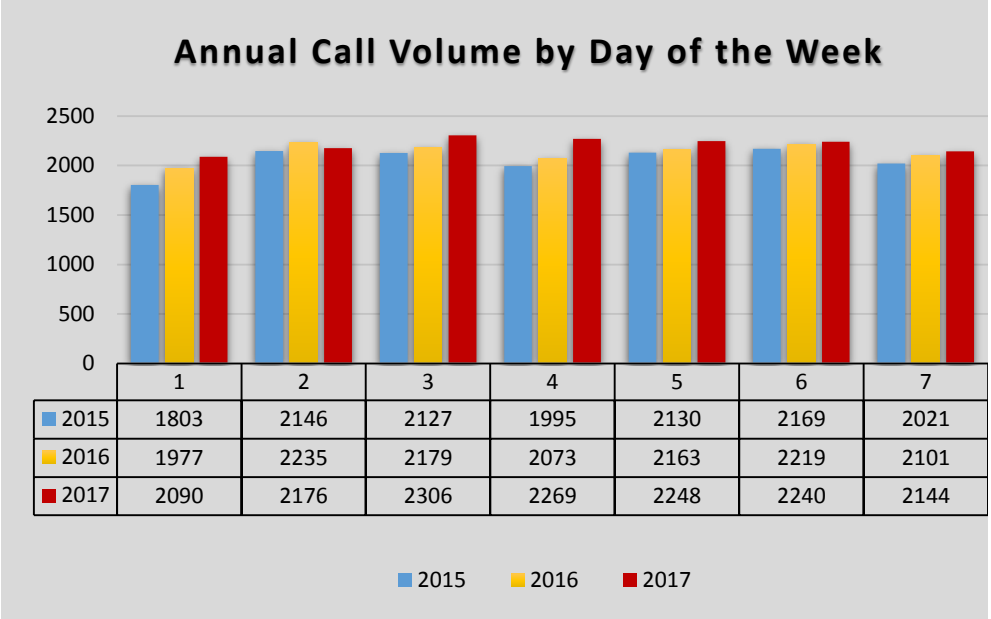


Figure 44: Call Volume by Month, Historical data from 2015-2017



	1	2	3	4	5	6	7
2015	1803	2146	2127	1995	2130	2169	2021
2016	1977	2235	2179	2073	2163	2219	2101
2017	2090	2176	2306	2269	2248	2240	2144

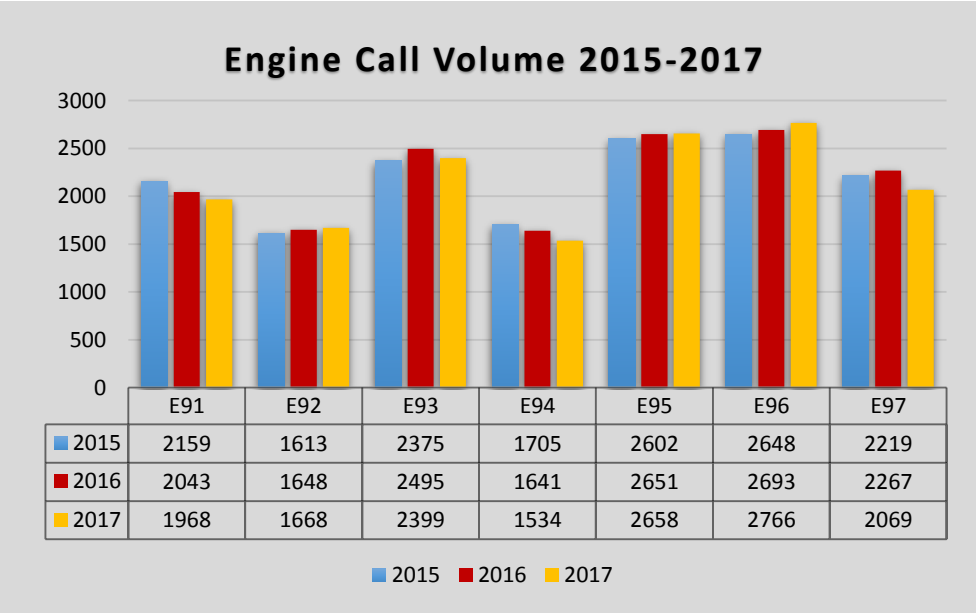
Figure 45: Annual Call Volume by Day of the Week, Historical data from 2015-2017

Significant Finding

- All days are trending upwards on call volume
- Weekends are slightly less impacted

Call Volume by Unit

The following charts contain the call volume by front line apparatus. Call volume does not indicate the effectiveness of the response; rather it is a measurement that indicates the busyness of the unit on emergency incidents. Units assigned to incidents affect the resiliency of the entire system to respond to calls for service within the affected area.



	E91	E92	E93	E94	E95	E96	E97
2015	2159	1613	2375	1705	2602	2648	2219
2016	2043	1648	2495	1641	2651	2693	2267
2017	1968	1668	2399	1534	2658	2766	2069

Figure 46: Engine Call Volume 2015-2017, Historical data 2015-2017

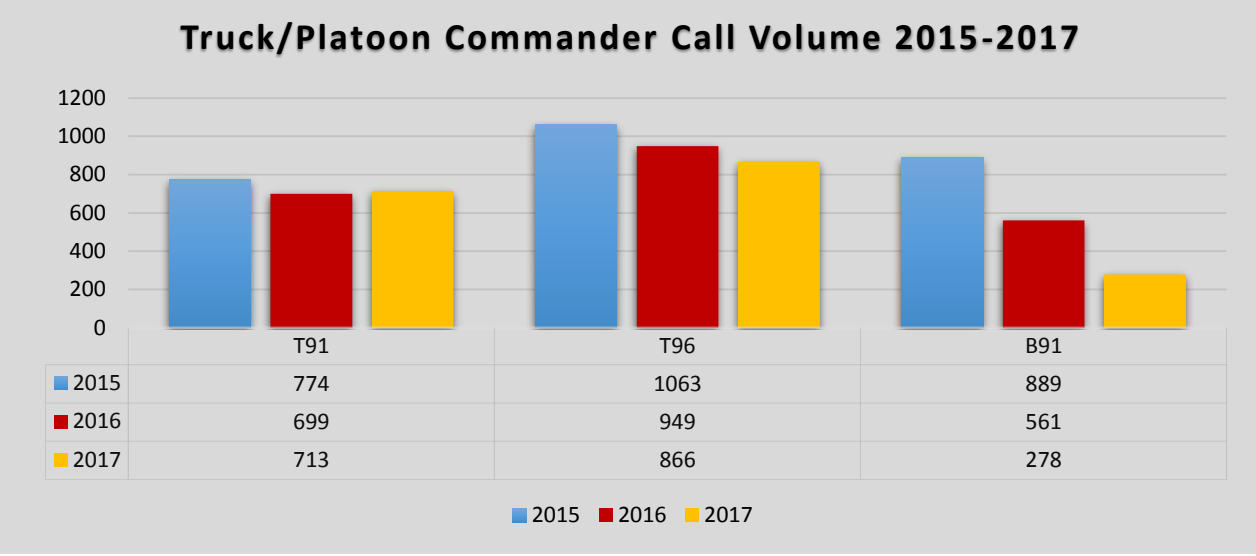


Figure 47: Truck/Platoon Commander Call Volume, Historical Data 2015-2017

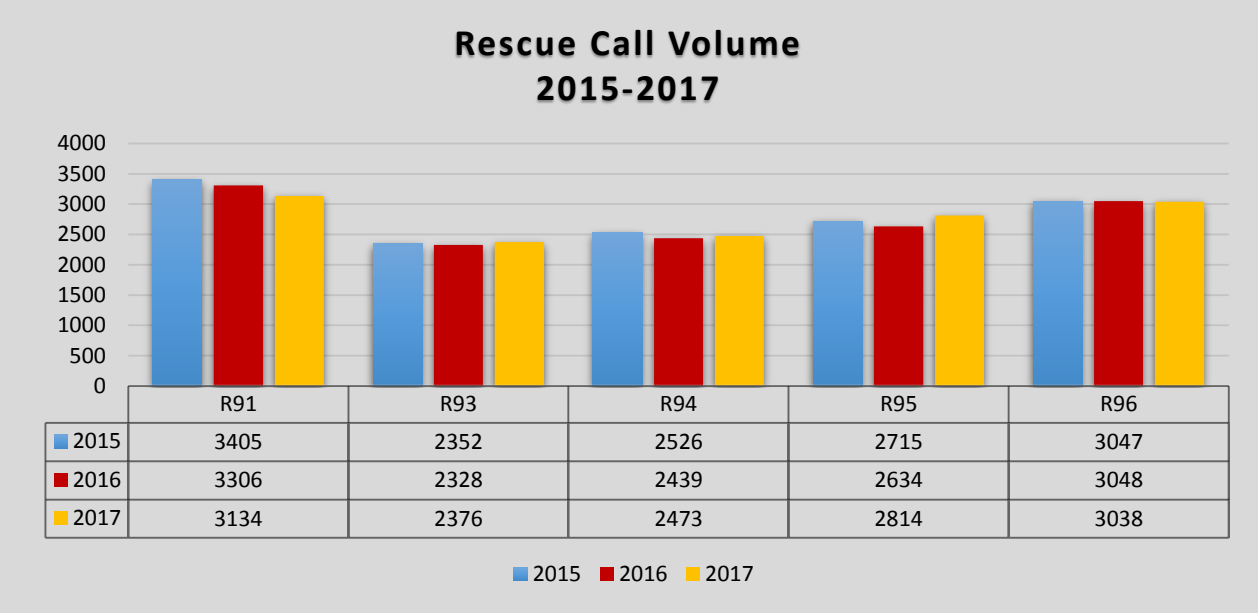


Figure 48: Rescue Call Volume. Historical data 2015-2017

Call volume for both trucks and the platoon commander have dropped off slightly due to the change in fire alarm response plans. The department analyzed the incident data and decided to reduce the initial dispatch assignment to a single engine company unless there was information indicating the presence of a fire or the first-in officer made an adjustment based on facts and/or intuition. The goal of the change was to send the appropriate units to a fire alarm, reduce unnecessary code 3 driving, and maintain distribution and concentration of resources throughout the city.

Call Volume by Hour of Day

Hour of Day	Year 2015	Year 2016	Year 2017
0	351	343	371
1	294	295	310
2	294	293	308
3	262	270	253
4	239	264	256
5	284	285	280
6	342	405	363
7	504	569	536
8	682	667	718
9	769	848	848
10	841	824	927
11	881	931	1055
12	902	911	977
13	887	947	977
14	859	899	916
15	833	846	909
16	804	910	853
17	770	844	816
18	750	743	787
19	684	702	725
20	630	604	664
21	568	601	602
22	482	467	490
23	401	388	442

Figure 49: Call Volume by Hour of Day, Historical data 2015-2017

Significant Finding-

- Call volume increases significantly from 8am-8pm
- The increased demand and traffic patterns during the day are presenting challenges to the TFD when it comes to meeting the response time criteria established to meet the community expectations

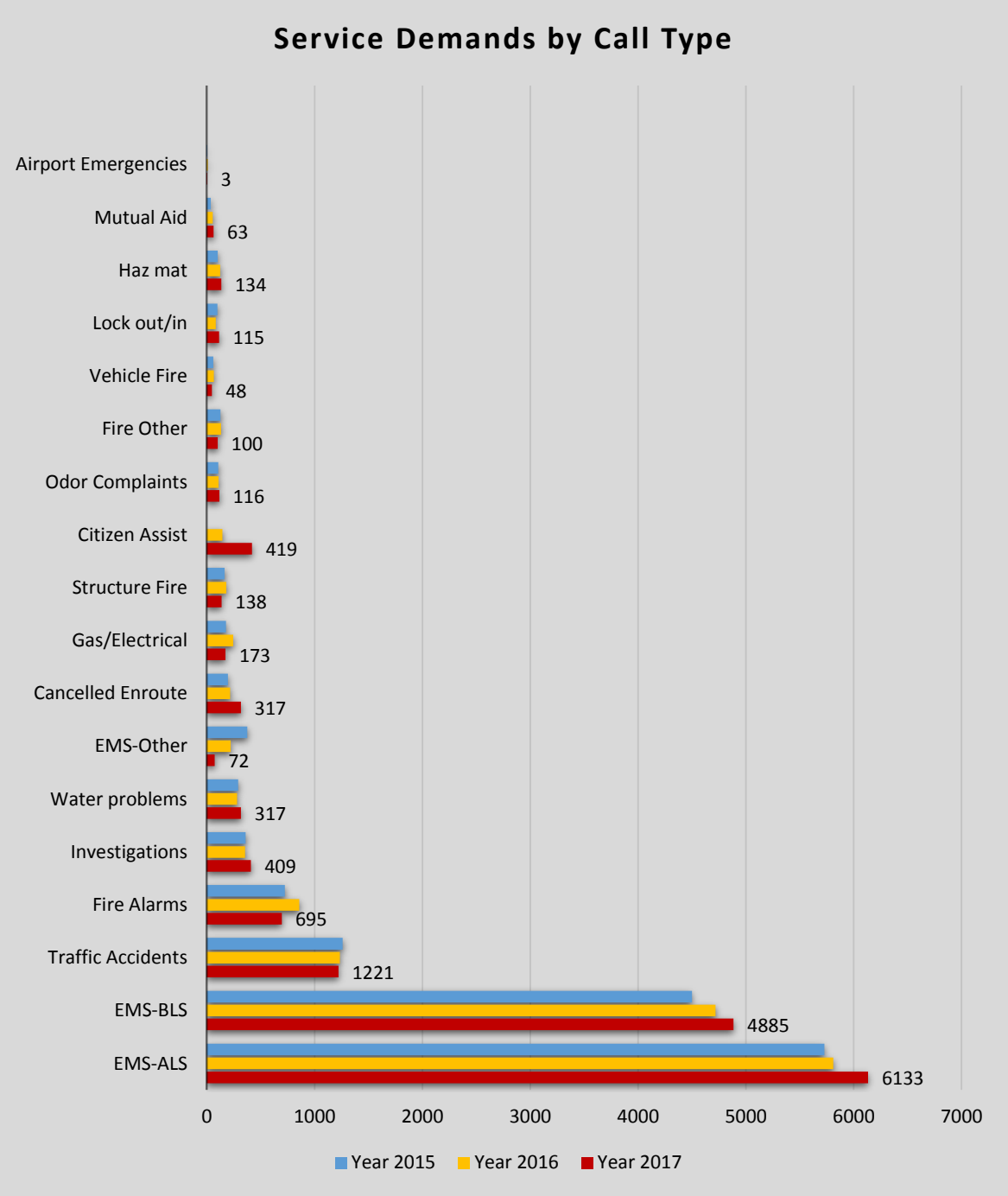


Figure 50: Service Demands by Call Type, Historical data 2015-2017

Significant Finding

- EMS calls accounted for 72% of all calls for service in 2017
- Traffic accidents accounted for 7.9% of all calls for service

Community Risk Categories

After evaluating community service demands through historical data, community risks were further analyzed by each hazard category. TFD reviewed a list of potential hazards consistent with historical data and FEMA guidelines for inclusion in the Community Risk Assessment and Standards of Cover. The team eliminated hazards that were not relevant to Torrance or did not pose a substantive threat. The graphic below highlights the hazards that were included in the assessment.

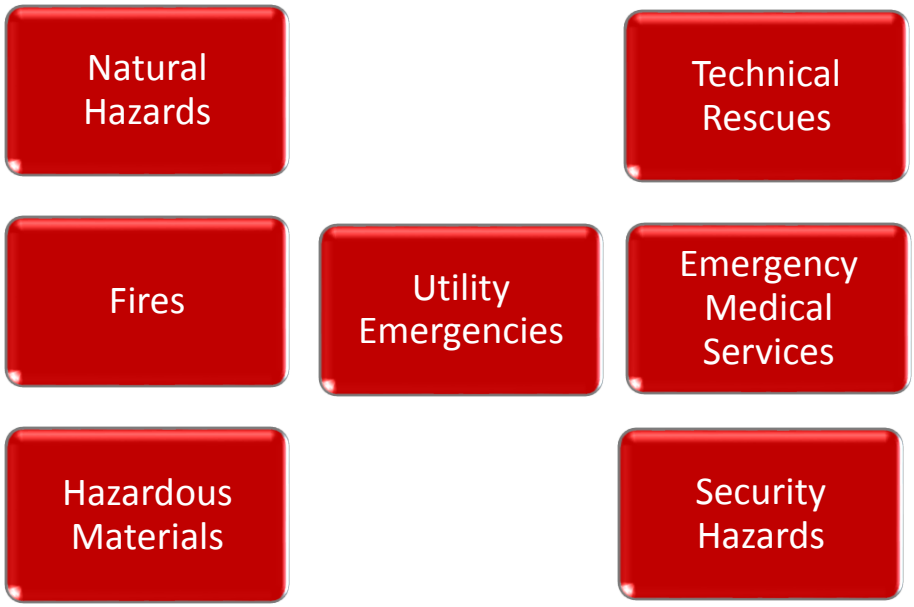


Figure 51: Community Risk Categories

Risk Matrix

The three primary components of assessing risks are an analysis of **probability**, **consequence, and impact on the agency**. **Probability** is the likelihood that a particular event will occur in a given time period. An event that occurs daily is highly probable. An event that occurs once every decade is unlikely. An assessment of **consequences** measures the result of an event. There are four main areas of concern when evaluating consequences: Firefighter Safety, Life Safety, Environmental (irreparable or long term damage to the environment) and Economic (loss of property, contents, income, or irreplaceable assets). The **impact** is evaluated by the number and type of resource required to mitigate the incident and the time it will require for the resources to complete the tasks. From the risk analysis, hazards are categorized as either low, moderate, high, or special risks.

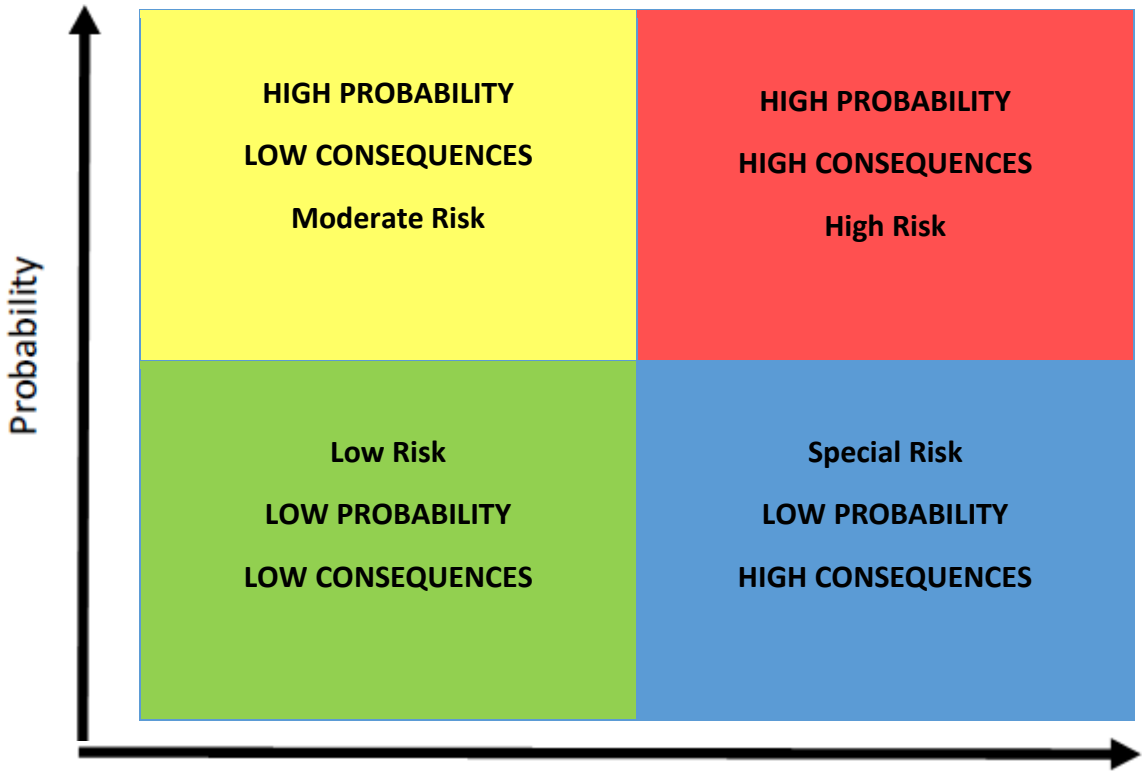


Figure 52: Risk Matrix

The probability and consequence and the community's service level expectation determine the concentration and distribution of TFD resources. Distribution is where resources are strategically located throughout the city. Concentration is the number of resources required in a given response area within the city based upon critical tasks that must be accomplished for expected outcomes. The distribution and concentration of resources is constantly evaluated based upon the number of calls for service, the risk factors of the area; the availability, reliability, and time of arrival of an effective response force, etc. By evaluating the impact of each risk type on the available resources the Department is able to strategically deploy resources and ensure optimal coverage capabilities. The community's threat of injury or loss increases as fire and emergency resources become depleted and are less available to emergency incident mitigation within the established time standards. The TFD is constantly evaluating the proper distribution and concentration of resources to meet the service demands of the city within the department budget.

The challenge in community risk management does not rely solely on the work necessary to assess the probability of an emergency event in a community, but also in the political world. It is common for policymakers to evaluate their return on investment; therefore, it is critical that policymakers are well informed about the community hazards and risks when making decisions that affect public safety. In California, local governments are facing increased budget scrutiny from their constituents and it is essential that they justify expenditures by demonstrating a direct link to expected outcomes.

Section 4 - Risk Assessment of Torrance by Hazard Category

Natural Hazards Assessment

Natural hazards have different impacts in varying locations and times, with the potential to severely impact human health and safety, property, ecosystems, and key services. Over a sufficient period of time, cyclical patterns of occurrence and recovery associated with natural hazards eventually become evident. These patterns can be identified and analyzed to create the most effective set of emergency management activities.

The City of Torrance adopted a Local Hazard Mitigation Plan (LHMP) through a resolution of the City Council, following approval of the plan by FEMA. This plan is intended to help make Torrance a safer place to live, work, and visit by identifying effective and feasible actions to reduce the risks posed by various hazards. The LHMP is consistent with current standards and regulations, to ensure that the understanding of hazards facing the community reflects current conditions and best available science, that the mitigation measures in the plan are grounded in best practices and available resources, and that the plan is consistent with Federal Emergency Management Agency (FEMA) requirements. As a member of the larger city team, TFD recognizes the plan and accepts the plans risk assessment methodology as valid for natural hazards.

In keeping with FEMA's recommendations, the City of Torrance convened a Local Hazard Mitigation Planning Team (the Planning Team), made up of representatives from different City departments. The Planning Team included representatives from the following departments: City Attorney, City Clerk, City Manager, City Treasurer, Communications and Information Technology, Community Development, Community Services, Finance, Fire, General Services, Human Resources, Police, Public Works, and Transit.

Members of the Planning Team reviewed a list of potential hazards consistent with FEMA guidance for inclusion in the Local Hazard Mitigation Plan. The team eliminated hazards that were not relevant to Torrance or did not pose a substantive threat, and added hazards that were not included in FEMA guidance but are applicable to the community. The table on the following page shows the possible hazards consistent with FEMA guidance that were evaluated to be included in the LHMP, and the reasoning behind the decision for each hazard.

Ultimately the Planning Team included Drought, Seismic Hazards, Extreme Weather, Floods, Disease and Pest Management, and Geological Hazards as vulnerabilities to include in the development of the LHMP. Each natural hazard includes a description of the hazard, the location and extent of the hazard, hazard history, risks of future hazards, and a vulnerability assessment.

Hazard	Decision	Reason for Decision
Avalanche	Exclude	Torrance and the immediate environs do not receive any appreciable snowfall or snow accumulation, as would be necessary for an avalanche to occur.
Dam failure	Exclude	Torrance is not within the potential inundation zone for any dam.
Drought	Include	Droughts have been a recurring and potentially severe hazard in Torrance.
Earthquake	Include	Torrance has experienced multiple strong earthquakes in the past.
Erosion	Exclude	Erosion is not a recognized issue in Torrance.
Expansive soils	Include	Expansive soils are present in Torrance and have historically caused damage.
Extreme cold	Include	Extreme cold events occur occasionally in Torrance.
Extreme heat	Include	Extreme heat events occur occasionally in Torrance.
Flood	Include	Floods are a recognized threat in Torrance which have occurred in the past.
Hail	Include	Hail events have occasionally occurred in Torrance.
Hurricane	Exclude	Current and anticipated climatic conditions make hurricanes extremely unlikely to directly affect the city.
Landslide	Include	Landslides have historically occurred in Torrance.
Lightning	Exclude	While lighting occasionally occurs in Torrance, it has not caused sufficient damage or otherwise been a hazard of concern to merit inclusion.
Sea level rise	Exclude	Torrance has no buildings or structures in low-lying coastal areas.
Severe wind	Include	Severe wind events have occurred in Torrance and occasionally have caused damage.
Severe winter weather	Exclude	Torrance is not in a climate that experiences severe winter weather.
Storm surge	Exclude	Torrance has no structures in low-lying coastal areas.
Tornado	Include	Tornadoes have occasionally occurred in the region.
Tsunami	Exclude	No buildings or structures in Torrance are within a recognized tsunami hazard area.
Wildfire	Exclude	Torrance is not located in or adjacent to any wildland or wildland-urban interface.

Figure 53: Natural Hazards Assessment Source: Torrance Local Hazard Mitigation Plan

After determining which hazards to include in the LHMP, the Planning Team prioritized each natural hazard based upon:

- Probability: the likelihood that the hazard would occur in the future
- Location: the size of the area affected by the hazard
- Maximum probable extent: the intensity of direct damage to structures in the community
- Secondary impacts: the severity of indirect community impacts

The Planning Team weighed each criterion, with probability being the most important, followed by location, maximum probable impact, and secondary impacts.

The table below shows the criterion scores, total scores, and threat levels for each hazard. Hazards that score between 0 and 12 are considered low-threat hazards, 12.1 to 42 is a medium-threat hazard, and scores above 42.1 are considered high-threat hazards. Further explanatory information regarding the methodology is available in the LHMP.

		Impact				
Hazard	Probability	Location	Primary Impact	Secondary Impact	Total score	Threat
Drought	4	4	4	4	64.0	High
Seismic hazards	4	4	4	4	64.0	High
Extreme weather	3	4	4	4	48.0	High
Flood	4	2	2	2	32.0	Medium
Diseases and pest management	3	2	2	2	24.0	Medium
Geologic hazards	2	2	3	3	20.8	Medium

Figure 54: Criterion Scores for Hazards, Source: Torrance Local Hazard Mitigation Plan

Drought Profile

Drought Description

In periods of low to no precipitation, long-term water shortages may emerge, creating a drought. In Torrance's Mediterranean climate, a rainy season that is concentrated between October and March often leaves the state with dry summer months. However, when these winter rains do not fall as anticipated, the diminishing water supply is strained under the sustained demand from cities and farms. Drought can lead to increases in the cost of water and increased regulations on water usage. If drought conditions persist and become more extreme, Torrance may experience reduced availability of water, creating the need to import supplies.

Secondary impacts of sustained drought may create additional risks for Torrance. As moisture evaporates, local soils may harden and decrease in permeability. This means that when rain does come, the ground is less capable of absorbing all of the water, decreasing groundwater recharge and increasing flooding risk. These dry conditions, especially when paired with dry and dying vegetation, can increase the risk of brush fires, although this risk is smaller within Torrance's boundaries.

Drought Location and Extent

Unlike other natural hazards, which can impact cities in sudden, specific, and often catastrophic ways, drought comes along slowly but is more distributed in its impacts, often gripping entire regions or states. It takes years of below- average precipitation to create a drought, and as a result it can take just as long to get out of one, requiring years of normal or above-average rainfall to remedy the impacts of drier years. The ramifications of drought vary across the cities in the largest impact area, depending on sources of local water supply, soil type, land use, and climate conditions. Communities that import water from drought-vulnerable regions of California may be more vulnerable to the impacts of drought because of a lack of sufficient local supply. The City's 2015 Urban Water Management Plan (UWMP) indicates that in 2015, approximately 88 percent of the City's potable water supply comes from imported sources, mainly the State Water Project and the Colorado River Aqueduct. State Water Project water is sourced from the northern Sierra Nevada, while water in the Colorado River Aqueduct comes from the Colorado River Basin, both of which regularly experience drought conditions.

Drought History

Droughts are a relatively frequent event in California, and many native plants and animals have evolved strategies to deal with long-term water shortages. Due to California's extensive water infrastructure networks, a drought in one part of the state may have a relatively small impact if the water supply in the affected area comes from another location that is not under drought conditions. However, Torrance receives most of its water from distant regions; therefore, a localized drought in the Sierra Nevada can have impacts on Torrance. Occasionally the state may experience a widespread drought that lasts for multiple years. A drought from 1928 to 1937 affected all parts of the state and was the longest drought in California's recorded history. Between 1976 and 1977, California experienced one of its most severe droughts, with 1977 the state's driest year on record. Since 2012, California has been experiencing drought conditions statewide. This drought is among the most severe in the state's history, initiating widespread restrictions on water use. In January 2014, the Governor declared a State of Emergency in California in response to drought conditions, which began in 2012. While 2017 was a good year for snowpack, the last quarters of 2017 and the beginning of 2018 were extremely dry statewide.

Southern California, which depends largely on a water supply imported from outside the region and major metropolitan areas, has invested significant resources to promote water storage, reliability, and conservation programs. Over $12 billion has been spent on these efforts, resulting in a new water storage reservoir in Hemet. In Torrance, the City has continued to diversify its water supply, which relies heavily on imported water, as discussed above. The City has developed several new sources of local supply, including groundwater wells in north Torrance, expansion of a groundwater desalination plant, and improvements to the existing recycled water system. These efforts are all in response to the Southern California region's continual struggle with water supply. To support conservation efforts and address the impacts of drought within the community, the City of Torrance adopted a Water Conservation Ordinance (Ordinance 3717), which prohibits wasteful water uses and encourages sustained conservation through use restrictions. In 2015, the City elevated the level of the Water Conservation Ordinance to Level 2 of 3 in order to address new challenges posed by California's drought.

Risks of Future Drought

The primary risks to Torrance in the future are continued drought and decreased snowpack in the Sierras and the Colorado River Basin, paired with a sustained reliance on a water supply imported from these regions. The Torrance Municipal Water Department (MWD) provides water to nearly 80 percent of the community. In addition to managing local water supply and procuring imports, the MWD is responsible for maintenance, operation, and repair of the water distribution system. Local, regional, and statewide drought conditions have the potential to impact the MWD's ability to provide water to its customers.

Scientific evidence suggests that precipitation levels across California, including in Los Angeles County, will decline as a result of climate change. This reduction in precipitation is consequently expected to reduce the Sierra Nevada snowpack. The State Water Project depends on this snowpack's gradual springtime melt to provide fresh water across the state, but as the accumulation of snow decreases, so will the amount of water that can be released for urban use in drier months. The flow of the Colorado River will also be impacted by climate change–related decreases in snowpack and potential decreases in precipitation, further impacting Torrance's largely imported water supply, although significant uncertainties remain about future precipitation levels in the Colorado River Basin.

Drought Vulnerability Assessment

During drought events, drought conditions will be present throughout Torrance and will not vary to any significant degree in different parts of the community. All community members will experience similar conditions. While direct effects will be equal for all residents and businesses, lower-income residents may be disproportionately affected if the City elects to increase water rates or levy fines against water customers with significant use. No critical facilities are likely to be affected.

Seismic Hazard Profile

Seismic Hazard Description

Earthquakes vary in size and intensity with a range of potential impacts. The amount of damage from an earthquake is determined not only by the duration and intensity of ground shaking, but also by the conditions in the impacted area, including soil conditions, construction quality, distance from the center of the earthquake, and the type of fault rupture. This hazard profile covers ground shaking, liquefaction, and fault rupture, the most common impacts from an earthquake.

Ground shaking is the primary cause of damage and injury during earthquakes. Ground shaking impacts can lead to surface rupture, liquefaction, landslides, and infrastructure failures, which could lead to fires and other secondary hazards. The geology of the impacted area alters the amount of ground shaking felt. Thick, water-saturated, unconsolidated materials will generally experience greater shaking motion than areas of firm bedrock.

Liquefaction happens when loosely packed sandy or silty materials saturated with water are shaken hard enough to lose strength and stiffness. Liquefied soils behave like a liquid and are responsible for tremendous damage in an earthquake, causing pipes to leak, roads and airport runways to buckle, and building foundations to be damaged. The risk of liquefaction depends on many factors, including the height

of the groundwater table and the composition of the soil.

Fault rupture is the actual movement and displacement of the ground's surface along the fault boundary when an earthquake occurs. Depending on the type of fault, this displacement may be horizontal, vertical, or both. Damage from fault rupture can be severe depending on the size of the displacement, but is limited to the relatively small area along the fault boundary where the slip occurred. Not all earthquakes result in fault rupture that is visible at the surface, and strong earthquakes can occur without any discernible displacement along the boundary. Such events are known as "blind thrust earthquakes."

Seismic Location and Extent

Ground shaking is one of the most destructive forces in a seismic event. Many factors impact the damage caused by ground shaking, including size of the earthquake, proximity to the ruptured fault, and local soil conditions. In Torrance, soft, unconsolidated sediments and soils underlie most of the city to depths of 100 feet. Because soft rocks are more capable of free-form movement, the seismic waves released from a fault rupture can be amplified throughout the ground beneath the city, with the potential for intensity levels to nearly double. Torrance is located near 16 known fault lines that could result in a major ground shaking event. For fault details, see the chart on page 54 and map on page 55.

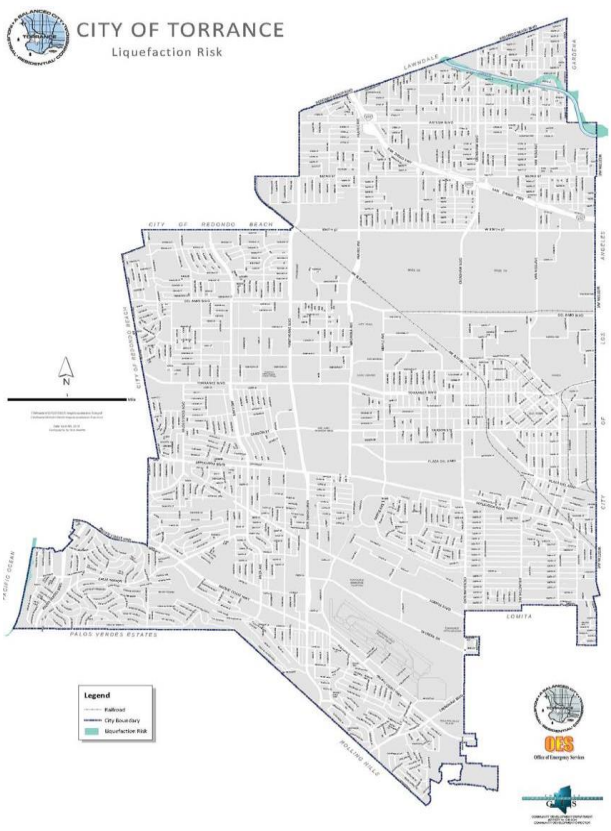
According to maps prepared by the California Geological Survey, areas of elevated liquefaction potential are only present in Torrance in very limited locations, as only a few places have both the high water table and the loose sediments in the soil that are necessarily to create a liquefaction risk. These areas are around the old Dominguez Creek (now Dominguez Channel) in northern Torrance, and on the beach itself, although not including any bluff top developed areas. See the map on page 54.

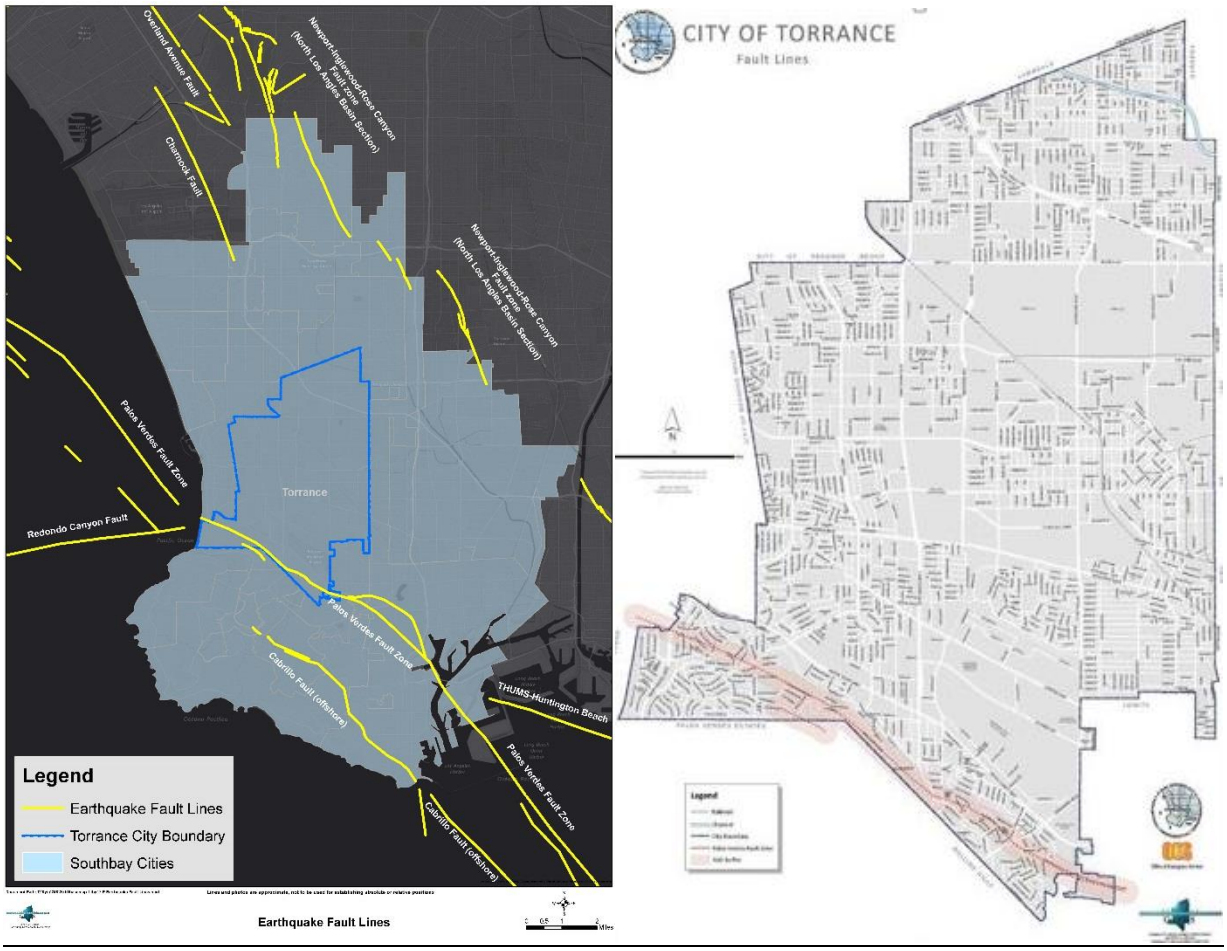
The risk of surface rupture exists in the immediate area around the Palos Verdes fault zone, which runs south of Pacific Coast Highway roughly parallel with it. This area is vulnerable to surface rupture if an earthquake occurs on the Palos Verdes fault, the only known fault in Torrance with the potential to cause surface rupture.

Seismic Fault Chart *Figure 55: Seismic Fault Charts Source: Torrance Local Hazard Mitigation Plan*

Fault name	Distance from Torrance (miles)
Palos Verdes	0–6.6
Puente Hills Blind Thrust	0.5–6.2
Puente Hills (Coyote Hills segment)	0.5–6.2
Puente Hills (Los Angeles segment)	8.3–15
Puente Hills (Santa Fe Springs)	10–16
Newport-Inglewood (onshore)	3–10
Elysian Park Thrust	10–19
Santa Monica	15–19
Malibu Coast	16–20
Hollywood	16–20
Upper Elysian Park	12–19
Anacapa-Dume	23–26
Whittier	18–25
Raymond	18–24
Verdugo	21–28
San Andreas (equivalent 1857 rupture)	47–54

Figure 56: City of Torrance Liquefaction Risk, Source: Torrance Local Hazard Mitigation Plan





Earthquake Fault Lines Palos Verdes Fault Line

Figure 57: Earthquake Fault Lines/Palos Verdes Fault Lines Source: Torrance Local Hazard Mitigation Plan

Seismic Hazard History

Earthquakes have impacted the land on which Torrance sits since the start of the region's recorded history. The City's General Plan Environmental Impact Report cites seismic events as far back as 1769, indicating the sustaining earthquake risk in the region. There is no known record of the Palos Verdes fault zone causing fault rupture within historic times. Given the limited presence of liquefaction-prone soils in Torrance, there is no substantial record of liquefaction within the community, although numerous liquefaction events have been recorded in the Los Angeles Basin. The table on the following page lists historical ground shake events in Torrance.

Significant Historical Earthquakes Affecting Torrance

Name	Year	Description
Elsinore earthquake	1910	This magnitude 6 earthquake occurred on May 15, at 7:47 a.m., following two moderate tremors that occurred on April 10 and May 12. The Elsinore fault is thought to have caused the earthquake, although no surface rupture along this fault was reported.
San Jacinto earthquake	1918	This magnitude 6.8 earthquake occurred on April 21 near the town of San Jacinto.
Long Beach earthquake	1933	The Long Beach earthquake occurred on March 10 following a strong foreshock the day before. The earthquake ruptured the Newport-Inglewood fault and was felt from the San Joaquin Valley to Northern Baja.
Torrance- Gardena earthquakes	1941	Two small earthquakes struck the southern Los Angeles Basin, affecting surrounding communities. Although these earthquakes were relatively minor, they occurred close to the surface and caused significant although local damage. The magnitude 4.8 Torrance earthquake occurred on October 21. A second earthquake occurred less than a month later, on November 14 at 12:42 a.m., near Wilmington. Shaking during the second earthquake was reportedly stronger than the first, locally reaching intensity level VIII and felt as far away as Cabazon, Carpinteria, and San Diego.
San Jacinto fault earthquake	1954	Also known as the Arroyo Salada earthquake, this magnitude 6.4 earthquake struck on March 19. The Clark fault of the San Jacinto fault zone may have been involved.
Borrego Mountain earthquake	1968	This magnitude 6.5 earthquake struck on April 8. It resulted in about 18 miles of surface rupture along the Coyote Creek fault (a branch of the San Jacinto fault zone), and triggered slip was observed on fault systems up to 40 miles away.
San Fernando (Sylmar) earthquake	1971	This magnitude 6.6 earthquake occurred on the San Fernando fault zone, the westernmost segment of the Sierra Madre fault, on February 9. The surface rupture caused by this earthquake was nearly 12 miles long and occurred in the Sylmar-San Fernando area.
Oceanside earthquake	1986	This magnitude 5.4 earthquake occurred on the morning of July 13 at 6:47 a.m. The epicenter was about 32 miles offshore from Oceanside on an unidentified fault that may be related to the San Diego Trough or the Palos Verdes-Coronado Bank fault zones.
Whittier Narrows earthquake	1987	The Whittier Narrows earthquake occurred on October 1, at 7:42 a.m., with its epicenter approximately 21 miles northeast of Torrance. This magnitude 5.9 earthquake occurred on a previously unknown, north-dipping concealed thrust fault (blind thrust) now called the Puente Hills fault.
Northridge Earthquake	1994	The 1994 Northridge earthquake occurred on January 17, at 4:30:55 a.m. PST and had its epicenter in Reseda, in the north-central San Fernando Valley region of Los Angeles, California. It had a duration of approximately 10–20 seconds. 57 dead, 5700 injured.

Figure 58: Significant Historical Earthquakes Affecting City of Torrance Source: California Geological Survey, Local Hazard Mitigation Plan

Given the limited presence of liquefaction-prone soils in Torrance, there is no substantial record of liquefaction within the community, although numerous liquefaction events have been recorded in the immediate area. Additionally, there is no known record of the Palos Verdes fault zone causing fault rupture within historic times.

Risks of Future Seismic Impacts

As indicated by nearly two centuries of earthquake records, the impacts of ground shaking related to seismic activity are expected to remain a risk in Torrance. Given the maximum estimated potential earthquake from faults near the community, the impact to Torrance from these events could be severe as outlined in the LHMP. The city's housing stock, 62 percent of which was built before 1970, may be especially vulnerable to a large ground shaking event, as these homes were constructed prior to strict building codes for resistance to ground shaking.

The liquefaction risk is expected to remain present in Torrance, as there is no known factor that will cause this risk to substantially decrease. Given the very small area of the city that is at risk of liquefaction, any future liquefaction risks are likely to be limited in scope. However, within these affected areas, damage from liquefaction may still be significant.

The risks for a fault rupture caused by the Palos Verdes fault zone is likely to remain low; however, a weaker earthquake, which has a higher chance of occurring, would still be capable of causing fault rupture in Torrance. Additionally, the Palos Verdes fault zone may cause an earthquake without resulting in fault rupture in the city.

Seismic Vulnerability Assessment

Seismic events in Torrance from an earthquake will be similar throughout the city, although parts of the community will likely experience slightly stronger or weaker shaking depending on the location of the earthquake and underlying soil conditions. Renters who may lack the control over their homes to conduct earthquake-resistant retrofits, or lower-income residents who may not have the financial resources for such retrofits, may be more severely impacted than the rest of the community. Renters may also be challenged by a potential shortage of available units in the event that a strong earthquake damages or destroys a large number of homes in the area. All critical facilities will be affected by earthquakes, although the specific threat to the facility depends on the location and strength of the earthquake, underlying geologic conditions, and the condition of the facility itself.

Extreme Weather Hazard Profile

Extreme Weather Description

While there is no single definition of extreme weather, it typically refers to a period of time in which the weather exceeds normal levels. The community risk assessment includes extreme weather events related to temperature, precipitation, and wind events.

Sustained high temperatures can create health issues such as heat exhaustion and heatstroke, especially for elderly persons and people who work outside. High humidity can exacerbate the problem by making

already hot conditions feel even hotter. Extreme cold temperatures, similar to extreme heat, occur when temperatures drop well below historical averages. This occurs when temperatures reach near freezing levels. Extreme cold can cause frostbite, which occurs when body tissue freezes, as well as hypothermia, which happens when body temperatures drop to abnormally low levels. Wind can make conditions feel colder than they actual are, a factor known as wind chill.

Extreme precipitation is evaluated in the form of heavy rain and hail. According to Webster's Dictionary, heavy rain is precipitation falling with an intensity in excess of 0.30 inches per hour. Extreme rain in Torrance may also be considered a normal rainfall for an extended period of time. Hail is a form of precipitation, made up of rough lumps of ice. Hail can damage windows, plants, and roofs. In rare instances, larger hail can cause more substantial damage, and in truly extreme instances, hail can cause serious injury or death.

While Torrance experiences some effects of Santa Ana Winds (Foehn winds), these winds typically do not result in wind damaging events in Torrance due to the location. The typically result of a strong Santa Ana wind event is usually hot temperatures with low humidity, not necessarily strong winds. Severe wind events in Torrance are more likely the result of a strong winter storm or a tropical storm that results in isolated thunderstorms.

Location and Extent of Extreme Weather

Extreme temperatures are generally distributed fairly evenly across Torrance. In Torrance, the threshold for extreme heat is 87°F. There is no precisely defined threshold for extreme cold, but average low temperatures in the city for the coldest months of the year are approximately 44°F, so any temperature below 35– 40°F may constitute extreme cold (59-Torrance Local Hazard Mitigation Plan-WRCC). Extreme heat is most likely to occur in September and October, while extreme cold is most likely to happen in January.

Severe precipitation and wind events may occur anywhere in Torrance and are not more or less likely to occur in any particular location. Torrance is more likely to experience extreme precipitation between November and March. Extreme wind events are most likely to occur during the same winter months, with the exception of the Santa Ana Winds which are more likely in the fall. The city has a significant number of large eucalyptus trees that present a hazard during significant rain and wind events.

Extreme Weather History

Extreme temperature events occur at least once in most years, although the severity of these events can vary significantly. There have been nine significant severe wind events in and around Torrance since 1955. The strongest of these occurred on April 18, 2000, and registered gusts of 87 miles per hour. No injuries or significant damage has been recorded as a result of any of these events (Local Hazard Mitigation Plan - NOAA 2015). Significant wind event due to always have to be extreme to cause a spike in calls of emergency response in Torrance. Torrance still has a majority of its electrical and communication equipment distributed on overhead power poles resulting in wires down and blown transformers.

Risks of Future Extreme Weather Events

Given the past occurrences of extreme weather events, these incidents are all but certain to occur in the future. While extreme cold should remain a hazard of concern in Torrance, extreme heat is expected to continue to pose the greater risk related to temperature. Wind and rain patterns remain consistent with past history; however, climate change should be monitored for its effect on the extreme weather events.

Extreme Weather Vulnerability

Extreme heat is particularly dangerous to older individuals. According to data from the US Census Bureau, in 2017 there are approximately 26,326 residents in Torrance over the age of 65, making up 17.5 percent of the population. Many elderly residents take medication that can reduce their body's ability to maintain a safe internal temperature, increasing the risk of heat-related illnesses during heat waves. Elderly residents are also more likely to live alone and to be socially isolated, further increasing their vulnerability. Similar factors can make heat waves particularly dangerous for immunocompromised individuals and others with increased social isolation. Individuals who spend a lot of time outdoors, such as construction workers, are vulnerable to extreme heat. Households without air conditioning units, or lower-income households concerned about the cost of running an air conditioner, may also face an increased risk. There is no specific risk to critical facilities, although stress on some electrical or mechanical systems may increase during heat waves.

Elderly and socially isolated individuals may be vulnerable to extreme cold due to physical conditions and a generally smaller social support network available to provide assistance when needed. While most Torrance households have heating (the US Census Bureau reports that only 909 households, or less than 2 percent of Torrance households, do not), the households that lack heat are vulnerable to very cold conditions, as are lower-income residents who may be unwilling or unable to incur the cost of heating. No critical facilities face a specific risk from extreme cold.

All Torrance community members face an equal chance that they will be exposed to severe wind and rain events. However, poorly built or poorly maintained structures may suffer greater damage, and such buildings are more likely to be occupied by renters or lower-income individuals. It is possible that these residents will be disproportionately affected by severe wind events.

Flood Hazard Profile

Flood Description

Flood events occur when normally dry land is partially or complete covered by water. In Torrance, floods are typically caused by precipitation heavy enough so that soil cannot absorb it fast enough, or storm drains cannot carry all the water away, causing water to build up on the surface (ponding). Flood events can also happen when infrastructure fails, such as a burst water tank or collapsed dam. Some flood events are the result of multiple factors.

Regardless of the cause of flooding, these events can damage buildings by the force of the rushing water itself or by large debris carried along in the floodwaters. Flood events can wash away soils, making foundations weaker and increasing the risk that structures may collapse. Flood events also create the risk of personal injury or drowning, particularly in the event of flash floods that may occur too fast for people to escape from.

Flood Hazard Location and Extent

The risk of flooding is highest in low-lying areas, particularly those adjacent to water bodies or flood control channels. Flood risks are usually described in years, e.g., 100-year or 500-year flood events. The areas within these flood risk zones are called the floodplain. The boundaries of the floodplains are established by FEMA and are re-evaluated as the need arises (60 Torrance Local Hazard Mitigation Plan-USGS 2015).

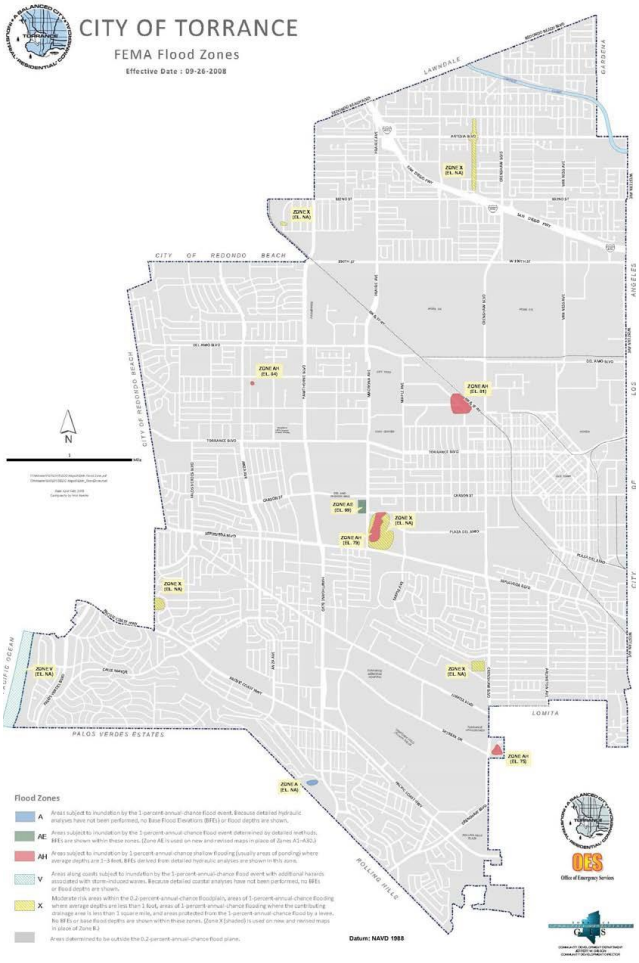


Figure 61: FEMA Flood Zones Torrance Local Hazard Mitigation Plan

In Torrance, the main area at risk of flooding is the western half of the Madrona Marsh nature preserve, which lies partly in the 100-year floodplain and partly in the 500-year floodplain. Some land north of the nature preserve across Plaza del Amo is within the 500-year floodplain, and a block of land northeast of the preserve (bordered by Plaza del Amo, Del Amo Circle East, West Carson Boulevard, and Madrona Avenue) is within the 100-year floodplain. Elsewhere in the city, the areas around the intersections of California Street and Alaska Avenue and of Amsler Street and Dormont Avenue are both in the 100-year floodplain, as is part of an undeveloped area near the intersection of Hawthorne Boulevard and Via Valmonte. Some land west of Crenshaw Boulevard between 235th and 237th Streets is within the 500-year floodplain, as are parts of the St. Lawrence Martyr School along the city's border with Redondo Beach. Torrance's beaches also are at risk of coastal flooding, but beachside development is outside of both the 100-year and 500-year floodplains; with the exception of a snackbar and restrooms. See the map for flood hazard locations.

Flood Hazard History

Torrance, which is not located near the major waterways of the Los Angeles Basin, has largely been free of significant flood events. Localized flooding has occurred occasionally, particularly prior to the construction of modern storm drains and water retention basins.

Risk of Future Hazards

Localized flooding is likely to continue to occur in the future, especially during significant storm events.

Major storms in California are frequently the result of meteorological phenomena called atmospheric rivers, which are narrow bands of very most air which in effect act as pathways for heavy precipitation. Although these storms make up a relatively small number of weather systems that affect the western United States, they typically cause 30 to 50 percent of all precipitation in the area (62 Local Hazard Mitigation Plan - NOAA). Another type of event, the El Niño Southern Oscillation (ENSO, or El Niño), can cause more intense storms and higher levels of precipitation in the western United States, especially in Southern California. Although Torrance does not have a history of significant flooding, a particularly severe storm or series of intense storms may cause more widespread flooding emergencies.

Torrance is also at risk of flooding from infrastructure failure. The Walteria and Ben Haggot Reservoirs, both owned by the City, are two buried water storage facilities with a combined capacity of 28.7 million gallons located along Crenshaw Boulevard near the city's border with Rolling Hills Estates. The failure of one or both facilities could create flooding in the area below the reservoirs. The prime risk of infrastructure failure to either reservoir is a significant earthquake, although the most likely outcome is cracks in the reservoirs that cause leaks and some localized flooding. However, a significantly strong earthquake could cause catastrophic failure of the reservoir walls. This "worst- case" scenario would drain the reservoirs in as little as 18 minutes and could inundate 215 acres. The inundation zone includes numerous residential and commercial properties, as well as the southeast portion of Torrance Municipal Airport.

Flood Hazard Vulnerability Assessment

The flood risk in Torrance in limited to specific areas, as previously discussed. Elderly or disabled individuals or persons without access to a private vehicle within the flood hazard zone may face an increased vulnerability to flood events, as they may have difficulty evacuating if floodwaters rise high enough. Lower-income residents or renters may also be more vulnerable to flood events, as they may lack financial resources or sufficient control over their residences to install flood-resistant features. There are no critical facilities within Torrance's flood hazard zones.

Diseases and Pest Hazard Profile

Disease and Pest Hazard Description

In urbanized areas such as Torrance, the primary threats from diseases and pest management–related hazards are to human health and street trees. People or plants may become infected by a disease-causing organism called a pathogen (e.g., a bacteria or virus), resulting in sickness. Some pests may not actually cause diseases, but they may cause damage or injury through other means.

The main human health concerns in Torrance are easily contagious diseases or infections, which could spread quickly through the community and cause significant harm. This includes pandemics, which are infectious diseases that spread throughout a wide region and often require substantial resources to slow or halt. Influenza (the flu) is one of the most widespread of these potentially serious diseases. Other diseases that have caused pandemic concerns in the Unties States include cholera, measles, and, severe acute respiratory syndrome (SARS).

West Nile virus (WNV) is another disease that poses a public health concern in California, although it is not contagious. Mosquitoes spread WNV when the mosquitoes bite an infected bird and then bite a person. The virus has no observable impact on 80 percent of people, while 20 percent will experience symptoms such as a fever, headache, or other symptoms similar to a cold or mild flu. For less than 1 percent of infected persons, the virus can cause severe neurological issues and may lead to death or permanent impairment (63Local Hazard Mitigation Plan - CDC 2015). The Zika virus emerged as a global health concern in 2015 and like the WNV, it is primarily through mosquitos.

Street trees may also be threatened by diseases or pests, which may weaken or kill the trees. Affected trees may no longer provide shade or other landscaping benefits and may be more susceptible to toppling over or broken branches, which can damage property and cause injury or death. Insects called aphids are among the most common type of pest. Swarms of aphids suck the sap from a tree's tissues, weakening it by depriving it of resources, and potentially introducing pathogens or other pests that may further damage the tree. Other insects, as well as bacteria, viruses, and fungi, may infect street trees and cause potentially widespread damage if not controlled. Trees stressed by drought conditions may be more vulnerable to infection.

Disease and Pest Hazard Location and Extent

Areas at risk of disease are not limited to any one part of Torrance, but diseases instead may affect any part of the community. The impacts of any disease may be more severe in some parts of the community with a greater proportion of vulnerable residents. Species of trees that are more vulnerable to infection or pest infestation may be more common in specific parts of Torrance, although the entire community is generally at risk from these hazards.

Disease and Pest Hazard History

There is no specific history of disease or pest management–related hazards in Torrance. Los Angeles County generally sees some severe flu cases each year, although the number varies significantly. On a few occasions elderly living facilities have been quarantined due to flu outbreaks. In addition, contagious diseases routinely impact the local hospitals which has a direct impact on the emergency medical services provided by the TFD.

Regarding pest management issues, the City is monitoring pests that impact city trees. One in particular that affects eucalyptus trees—the red gum lerp psyllid—is a known vector that causes stress on trees, which can contribute to higher tree mortality.

Risk of Future Diseases and Pests Hazard

It is likely that various infections and pest infestations will continue to be an issue in Torrance. The flu will likely continue to be the most prominent significant disease in the community, as the virus changes rapidly and has proven impossible thus far to eradicate, although basic hygiene substantially reduces the odds of being infected, and vaccines that provide protection against the most common flu strains are widely available. WNV has proven similarly difficult to eradicate, although it remains fairly rare and can

be constrained by reducing the risk of mosquito bite by using insect repellents, using screens and protective clothing, and draining pools of stagnant water where mosquitoes breed. Regular inspections of street trees and selecting disease-resistant species can help reduce the loss of vegetation from pest infestation.

Disease and Pests Hazards Vulnerability Assessment

Disease and pest management hazards pose the greatest risk to elderly residents, young children, and immunocompromised individuals, as these persons are most likely to be severely affected by various pathogens. However, diseases, particularly influenza and other diseases that pose a risk of causing pandemics may affect all residents. Plant diseases or pests may affect landscaping at critical facilities, but buildings and structures themselves are not affected by disease and pest management hazards.

Geologic Hazards Profile

Geological Hazard Description

Geological hazards present in Torrance include methane gas, expansive soils, and landslides.

Methane (CH_4) is a colorless, odorless gas that is the simplest of a group of molecules called hydrocarbons. Methane occurs naturally primarily by the decomposition of organic materials in an anaerobic (oxygen-free) environment. Methane is often found in high concentrations in the soil in areas with natural gas deposits. Methane is also commonly found near petroleum deposits. Methane can pose a substantial health and safety hazard. Although methane itself is nontoxic, it is an extremely flammable gas, and potentially explosive in certain concentrations. A sufficiently high concentration of methane in the air may displace oxygen, creating a risk of asphyxiation if methane levels rise high enough. The gas can seep out from the ground into the surface, posing risks in areas above methane-containing soils. It can be trapped underneath impervious surfaces such as roadways, or in enclosed underground areas such as basements or tunnels, potentially allowing concentrations to rise to dangerous levels if the gas is not vented out.

Expansive soils contain high levels of materials that can absorb large amounts of water, such as certain types of clay. When the ground is wet, these materials absorb water and swell, and then shrink as they dry out. This process can exert significant force on structures, and over repeated cycles of expansion and contraction this force can be sufficient to crack foundations, floors, and other ground level or subterranean structures. Cracks may form in expansive soils when they are dry, potentially creating a safety hazard.

Landslides occur when the soils on a hillside become unstable and slide down toward the base of the slope. This movement can damage or destroy structures built on or in the soil, and cause damage to objects in the path of the landslide. While landslides are often thought of as fast-moving events, they may unfold slowly over the course of days, weeks, months, or even years, depending on the conditions of the hillside and the factors causing the slide. The types of materials that make up the slope and the steepness of the hill determine the risks of a landslide. Many different events may trigger a landslide, but earthquakes and moisture are the most common.

Geological Hazards
Location and Extent

Methane-containing soils are usually associated with oil and gas deposits, both of which are found in Torrance. The Torrance Oil Field lies under the middle of the city, in an area roughly north of Lomita Boulevard and south of the main railway lines, which run through the community. This area is more likely to contain methane-containing soils, although such land may be found beyond the boundaries of the Torrance Oil Field and methane seeps are not present throughout the entire field. The pressure of the Torrance Oil Field is lower than other fields in the Los Angeles region, so extensive testing has not been conducted throughout the area. Any methane seeps in the area are believed to be small (64Local Hazard Mitigation Plan-Torrance 2008b)

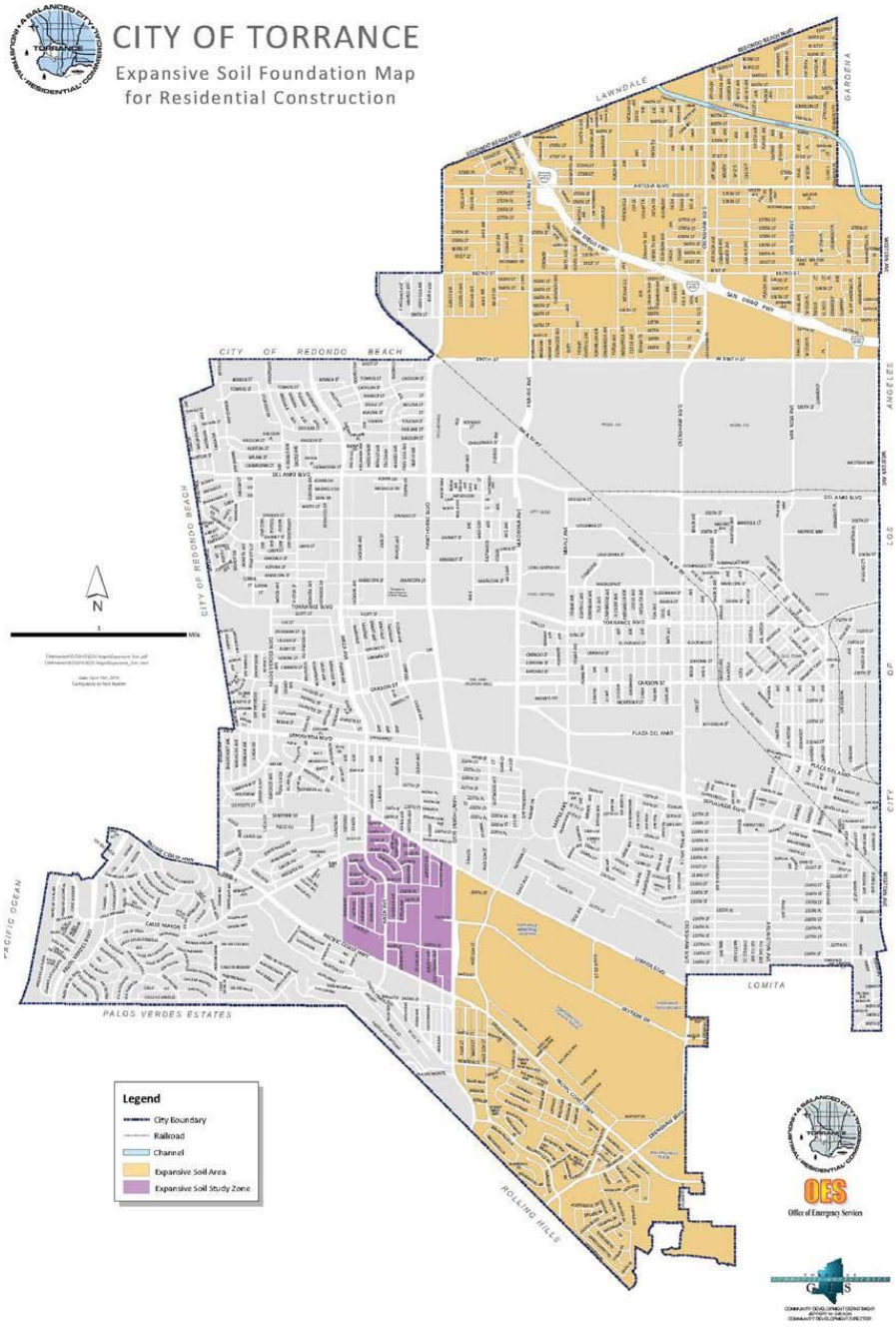


Figure 65: City of Torrance Expansive Soil Foundation for Residential

Expansive soils in Torrance are concentrated in two areas of the city: (1) northern Torrance, encompassing the area north of 190th Street and east of Hawthorne Boulevard; and (2) the southern part of the community, including the area south of Lomita Boulevard and east of Hawthorne Boulevard. An adjacent area, bounded by Pacific Coast Highway, Hawthorne Boulevard, Lomita Boulevard, and Calle Mayor School,

is in a study zone for expansive soils, although these soils may not be present in this area. The map on p. 64 shows the location of expansive soil areas in Torrance.

In Torrance, the areas with an elevated landslide risk are along the southern border of the community along the base of the Palos Verdes Peninsula. The vast majority of these landslide areas are south of Pacific Coast Highway. The shores of Walteria Lake, north of Pacific Coast Highway, are also at risk from landslides (66 Local Hazard Mitigation Plan - CGS 1999b, 1999c). The map on the right shows landslide prone area.

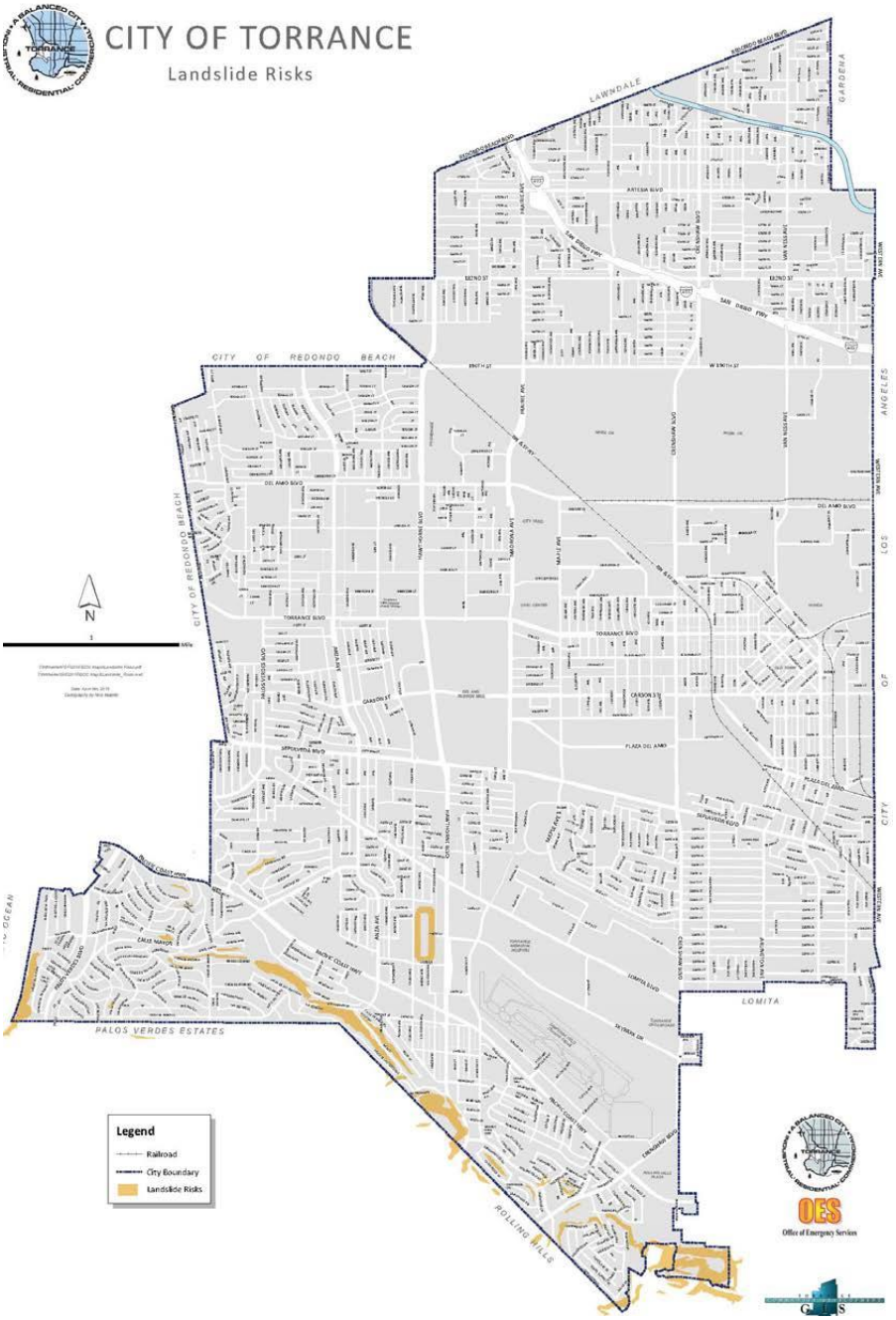


Figure 67: City of Torrance Landslide Risks Map

Geological Hazard History

While Torrance has historical methane emergencies, the causes have been the result of ruptured piping not geological causes. Torrance has no significant history of methane-related emergencies from geological events. Buildings throughout Torrance, including multiple public schools, have methane ventilation systems to prevent gases from building to dangerous concentrations. The presence of expansive soils in Torrance has caused occasional damage to structures that were not built to be resilient to these soils. In southern Torrance, residents have noticed the effects of expansive soil since homes were constructed in the 1960s. These homes are constructed on land that was previously very flat marshland. Damages to these structures are not necessarily linked to a specific event.

Torrance has seen occasional landslides in the southern parts of the community along the sea cliff and the base of the Palos Verdes Peninsula. Two substantial landslides have occurred in recent history. In 1986, a landslide near Vista Largo and Via Corona caused severe damage to two homes, which were demolished as a result. A 1998 landslide near Carolwood Lane and Singingwood Drive affected the backyards of 24 homes.

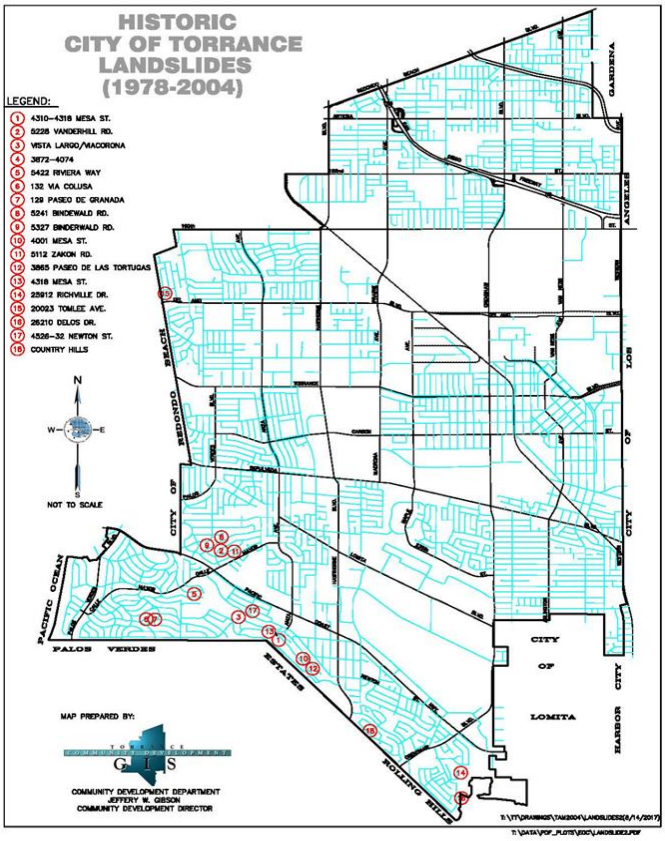


Figure 68: Historic City of Torrance Landslide (1978-2004)

Future Geological Hazards

Methane leaks are a natural geologic feature in Torrance and so are likely to continue in the future, although the severity of the seepage may change depending on the type and volume of oil and natural gas extraction activities carried out at the Torrance Oil Field. The community's expansive soils will continue to swell and contract as they get wet and then dry out, potentially causing damage. Landslides are likely to continue to occur occasionally in Torrance. Increased development activities at the top or base of landslide-prone slopes, including construction activity in the Palos Verdes Peninsula communities above Torrance, may exacerbate landslide risks.

Geological Hazards Vulnerability Assessment

The threat from methane-containing soils varies throughout the community, as some specific locations face an increased threat. Lower-income residents and renters in the threat zones for these hazards may not have the financial capacity or the control over their facilities to install features that make buildings resistant to these hazards. Because methane-containing soils have not been mapped in the community, it is unknown which critical facilities are at risk from methane.

The risk of expansive soils varies depending on specific location. Lower-income residents and renters in the risk area for expansive soils may be more vulnerable to this hazard, as they may be unable to retrofit their buildings to resist the forces created by the swelling and contraction of expansive soils. Expansive soils are also a threat to 40 different critical facilities.

The landslide risk area in Torrance, as previously mentioned, is located along the base of the Palos Verdes Peninsula. While there is no evidence that this area is more or less vulnerable than the rest of Torrance,

some residents in this area may be unable to retrofit their homes to be more resilient to landslides (often due to limited financial resources or renting their home), so they may be disproportionally affected by landslides.

Critical Facilities

Critical facilities are properties that serve an important function or service to the community and to the City government. In some instances, critical facilities help to provide key services, such as public safety or utilities, or serve as vital transportation links. Other critical facilities, such as administrative centers, are necessary to maintain government operations during a disaster and can help coordinate response and recovery activities. In some instances, critical facilities can act as temporary emergency shelters or as staging and coordination grounds for response and recovery operations.

In the LHMP, the City of Torrance has identified 135 individual critical facilities. In some instances, these individual facilities are collectively part of a larger property (for example, the hangars at Torrance Municipal Airport are treated as three individual facilities, although they are similar in terms of function, location, and vulnerability). There are five categories of critical facilities in Torrance:

- Bridges: road and railway bridges, including overpasses
- Government facilities: City-owned properties, including administrative centers, fire and police stations, and community facilities (e.g., libraries, community centers, parks)
- Schools: public and private elementary, middle, and high schools, as well as vocational schools
- Transportation routes: key evacuation routes
- Utilities: water and wastewater infrastructure, including pumps, wells, and key pipe connections

Most of the critical facilities (109, or 81 percent) have been prioritized on a scale of 1 to 3, with 1 being the most important. While the local hazard mitigation plan does not state the purpose, it is believed that the facilities that did not receive a priority rating are small park facilities. Additionally, the transportation routes that received a priority rating as key evacuation routes are the 405 Freeway and Pacific Coast Highway. The following table and map show the number of critical facilities in Torrance by type and priority the location of the critical facilities in the city.

Facility Type	Number of Critical Facilities				
	Priority 1	Priority 2	Priority 3	No Priority Given	Total
Bridges	0	14	0	0	**14**
Government facilities	11	7	0	26	**44**
Schools	0	45	0	0	**45**
Transportation routes	0	2	0	0	**2**
Utilities	0	13	17	0	**30**
Total	**11**	**81**	**17**	**26**	**135**

Figure 69: City of Torrance Number of Critical Facilities

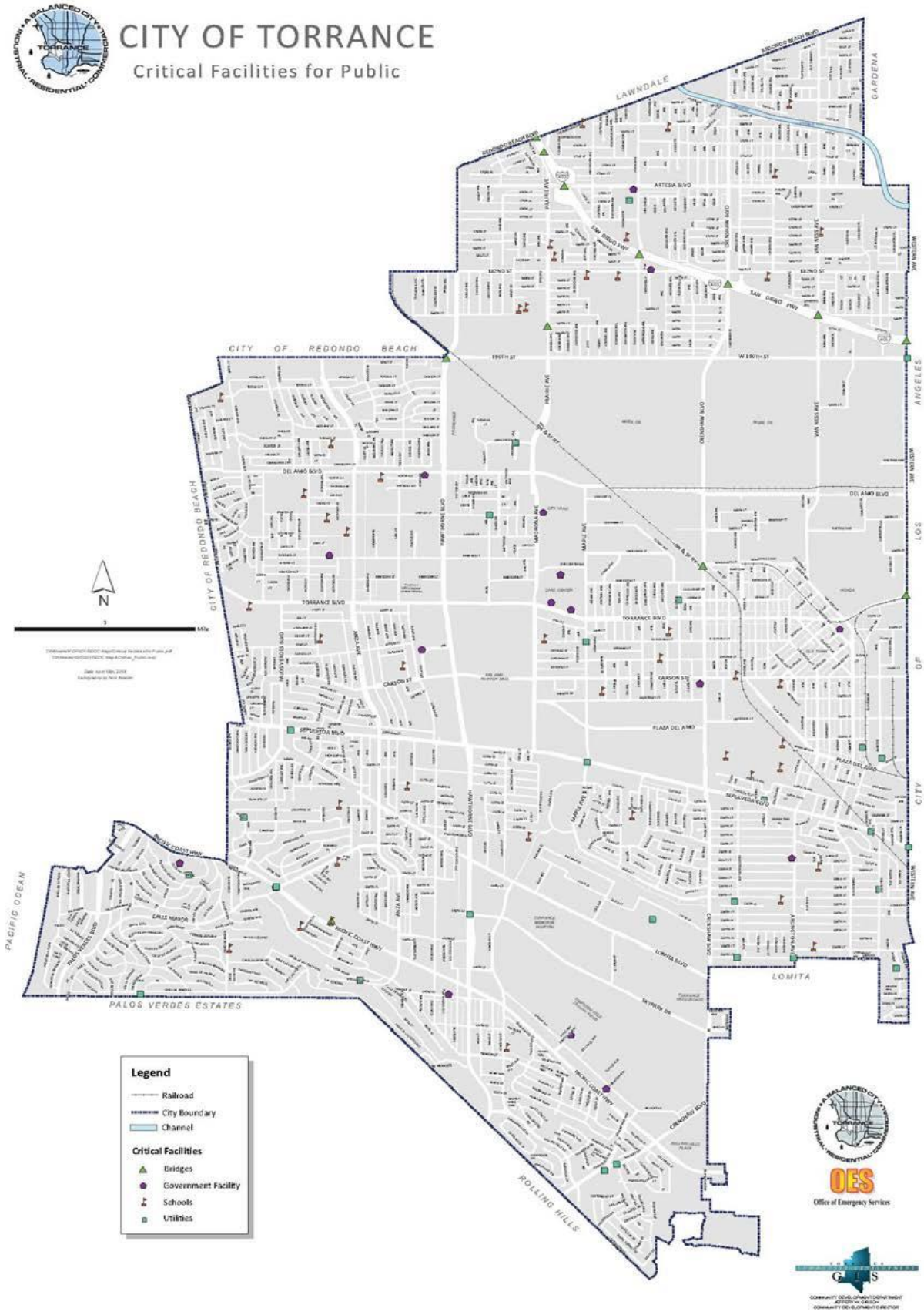


Figure 70: City of Torrance Critical Facilities Map

Fire Hazard Assessment

Torrance Fire Department responds to over 15,000 calls for service annually. TFD groups fire incidents into **"Structure Fires"**, "**Vehicle Fires"**, **"Fire Alarms"** and "**Other Fire"** types. "**Other Fire**" types include rubbish fires, brush fires, non-vehicle mobile property fires, and other outside fires. To begin a thorough risk assessment, the below **tables** demonstrate the community demand over for fire suppression for years 2015-2017.

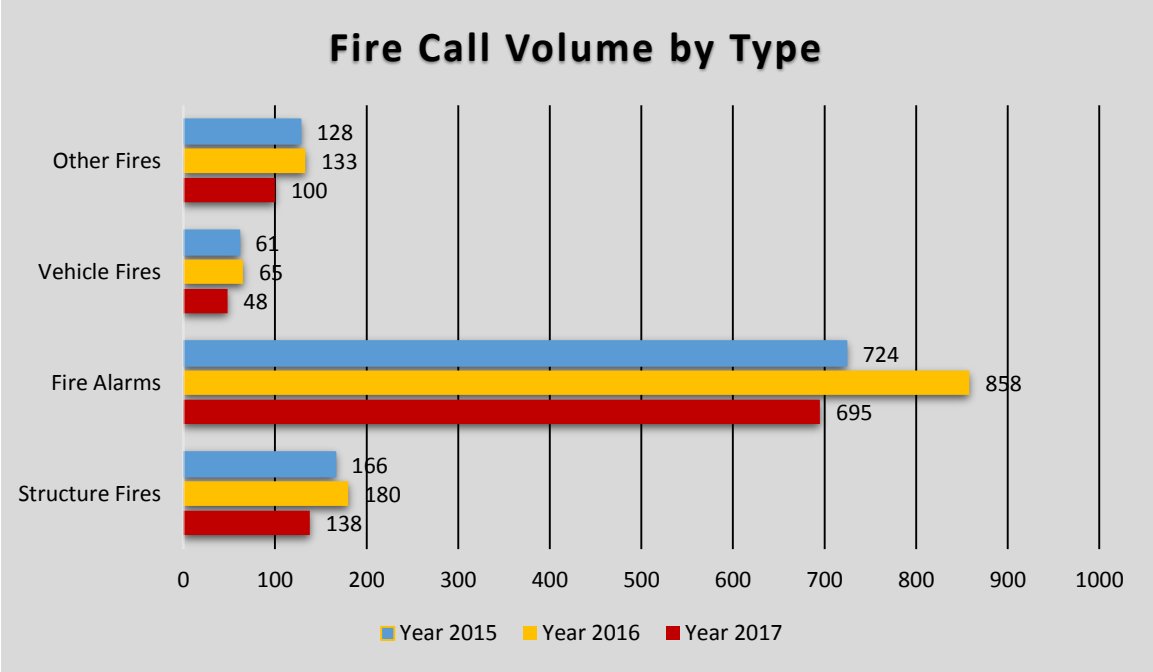


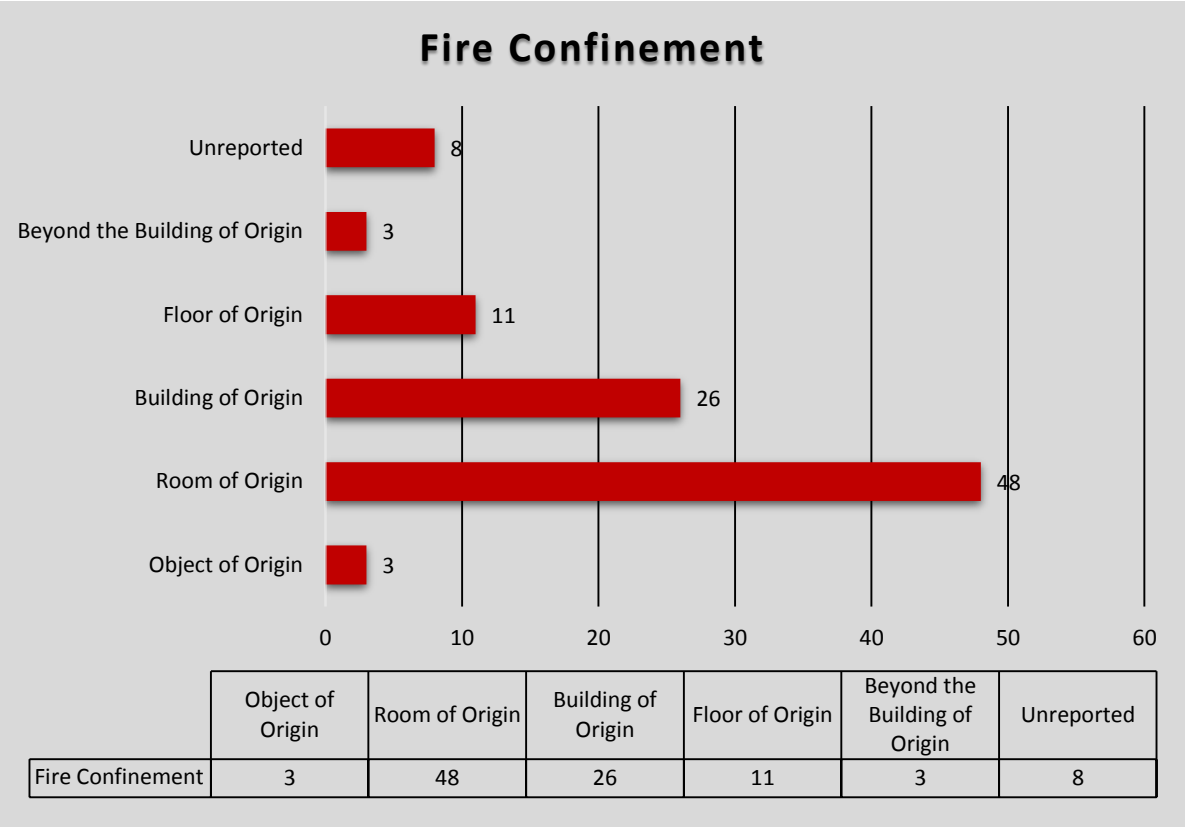
Figure 71: Fire Call Volume by Type, Historical Data 2015-2017

The above call type data is based on CAD dispatch codes which typically represent the initial reported emergency. Often times, the actual incident will end up being something different than the initial report. These changes are reflected in the records management system when the member making the report provides the most accurate data related to the incident. The CAD data for years 2015-2017 indicates that TFD responded on 484 reported structure fires; however, during the same time period "building and structure" fires only accounted for 99 incidents as reported in the National Fire Incident Reporting System (NFIRS). There are a variety of factors that lead to the gap between structure fires reported and the actual number of structure fires. The number one reason for the discrepancy is a lack of reliable and timely information during the call handling. If there is any doubt about the nature of the fire, the dispatcher is trained to send resources to deal with the "worst case" scenario based upon the known information. As more information becomes available, the resource request can be appropriately downgraded.

Significant finding from the chart above

Fire decreased in all fire call types in 2017

In addition to community demand, the TFD records data on property/content lost and saved as well as where the fire is confined. The chart below illustrates community outcomes related to the confinement of fires. This data was extracted from the TFD Records Management System.



	Object of Origin	Room of Origin	Building of Origin	Floor of Origin	Beyond the Building of Origin	Unreported
Fire Confinement	3	48	26	11	3	8

Figure 72: Fire Containment Chart for building and structure fires during 2015-2017 Source: TFD Records Management System

Significant finding from the above chart include:

- TFD documented 99 building or structure fires during the 3-year period
- 51% of the building fires were contained to the object or room of origin
- 65% of the building fires were contained to the floor of origin
- 97% of all building fires were contained to the building of origin

In conducting fire risk assessment, TFD tracks and measures the monetary loss of property and contents as a result of fires. The charts below demonstrate the property lost and saved for calendar years 2015-2017.

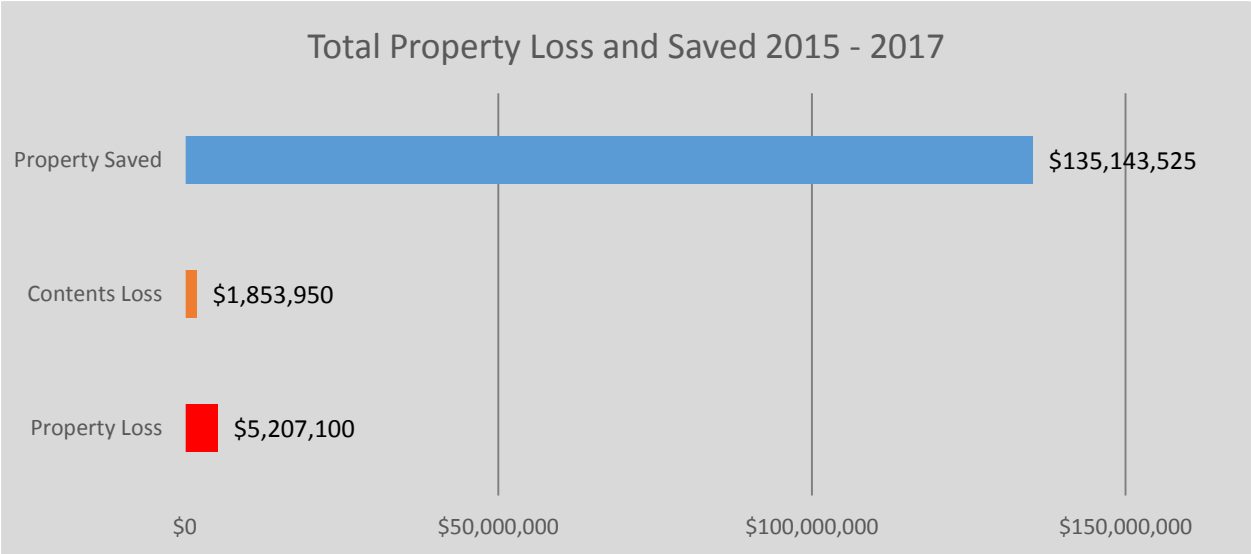


Figure 73: Total Property Loss and Saved 2015-2017, Historical data 2015-2017

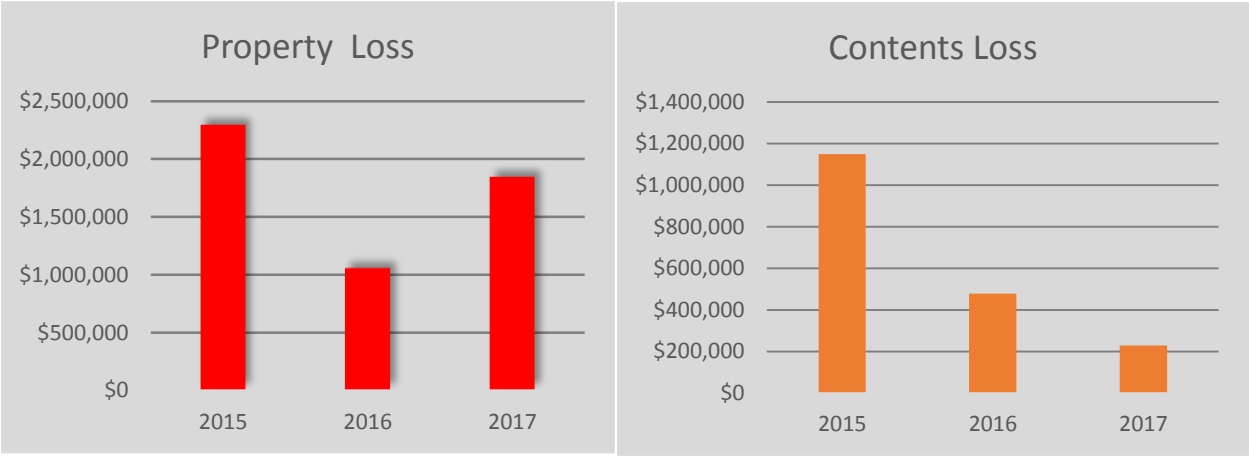


Figure 74: Property & Contents Loss, Historical data 2015-2017

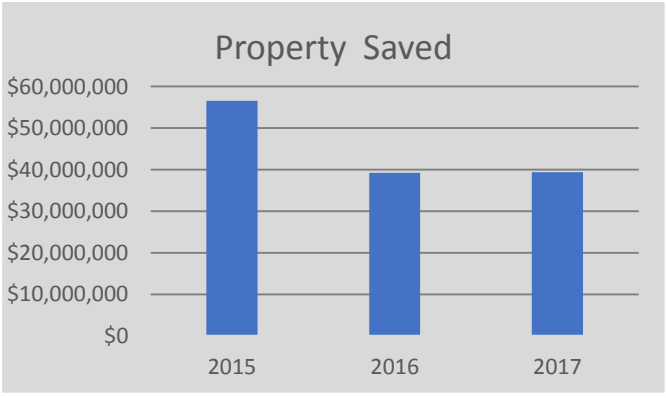


Figure 75: Property Saved, Historical Data 2015-2017

In 2017, the external stakeholder community group participated in the 2018-2023 TFD Strategic Plan development and identified Fire Suppression as the second highest priority program that the TFD provides. The community further expected the fire personnel to respond quickly, be professionally trained, and have proper equipment to mitigate the effects of destructive fires.

Firefighters encounter a wide variety of conditions and hazards at every fire. Providing for Life Safety, Incident Stabilization, Property Conservation, and Firefighter Safety are critical to reducing the negative impacts of fire events. During fire suppression, service-level objectives are intended to prevent the flashover point, a particular point of a fire's growth that makes a significant shift in its threat to life and property. Fire suppression tasks required at a typical fire scene can vary a great deal based on conditions found by the responding units. What all TFD companies must do, simultaneously and rapidly if they are to limit negative impacts, is to arrive within a short period of time with adequate resources to accomplish control objectives.

Changing Fire Environment

While there has been a lot of scientific research completed to validate the changes in the modern fire environment, the basic chemistry and physics of fire remain the same. The major change in the modern fire environment is the compartments that modern fires are burning and the products that are within the environment. Synthetic products, plastics, vaulted ceilings, dual paned windows, and a variety of other factors have accelerated fire growth and increased heat release rates resulting in a greater risk to occupants and firefighters. Virtually all structure fires progress through a series of 4 identifiable stages:

Stage 1: The Incipient Stage- This first stage begins when heat, oxygen and a fuel source combine and have a chemical reaction resulting in fire. This is also known as “ignition” and is usually represented by a very small fire that often goes out on its own, before the following stages are reached. Recognizing a fire in this stage provides your best chance at suppression or escape. This is the stage of fire that TFD train lay persons to implement the use of a fire extinguisher.

Stage 2: The Growth Stage- During the growth stage the structure’s fire load and oxygen are used as fuel for the fire. There are numerous factors affecting the growth stage including where the fire started, what combustibles are near it, ceiling height and the potential for “thermal layering”. It is at the conclusion of this shortest of the four stages where a deadly “flashover” can occur; potentially trapping, injuring or killing occupants or firefighters.

- Flashover The fire rapidly transitions to the fully developed stage. Research into the flashover phenomenon has yielded criteria that precisely measure when flashover occurs; however, any exact scientific measurement in the field is extremely difficult. Observable events that would indicate a flashover has occurred are "total room involvement" and "free burning." Flashover has been a contributing factor on many firefighter line of duty deaths and must be considered during every compartmentalized fire. Temperatures can reach between 1,000 and 1,200 degrees Fahrenheit during a flashover. When this temperature range is reached, all combustibles are immediately ignited. At the point of flashover, lethal fire gases (carbon monoxide, hydrogen sulfide, cyanide) increase explosively. People exposed to these gases, even when not directly

exposed to the fire, have drastically reduced chances of survival. ***Human survival after this point is highly improbable without specialized protective equipment.***

- Flashover can occur within a relatively short period of time. Precisely controlled scientific tests indicate that flashover can occur in as little as two minutes from the flame stage; however, that is not always the case in the field. There is hard data on time to flashover since it is not possible to determine when a fire started. Nevertheless, a correlation can be drawn between flashover and the fire protection system or extinguishment process.
- The number of times that fires are controlled before flashover depends on the entire fire protection system and is not solely dependent on TFD personnel. Built-in fire protection, community risk reduction strategies, public education, extinguishment by citizens, and even the type of fuel on fire are all factors that affect flashover. Once a fire reaches flashover, a greater number of firefighters will be required to extinguish the fire. A post-flashover fire burns hotter and moves faster, compounding the search-and-rescue problems in the remainder of the structure at the same time more firefighters are needed for fire combat operations.
- The illustration below indicates fire growth and the need to incorporate fire protection systems prior to flashover in an effort to increase occupant survivability and firefighter safety.

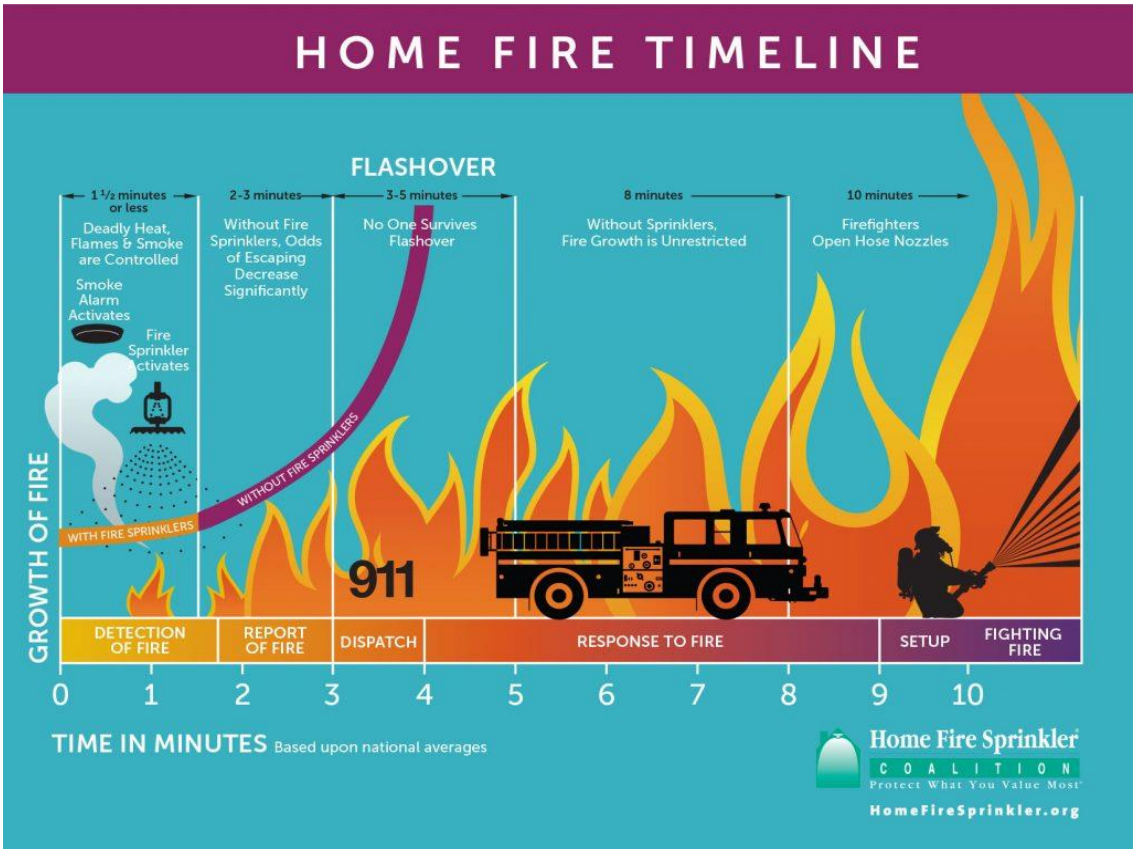


Figure 76: Home Fire Timeline Source: HomeFiresprinkler.Org

Stage 3: Fully Developed Stage- When the growth stage has reached its max and all combustible materials have been ignited, a fire is considered fully developed. This is the hottest phase of a fire and the most dangerous for anybody trapped within.

Stage 4: The Decay Stage- Usually the longest stage of a fire, the decay stage is characterized by a significant decrease in oxygen or fuel, putting an end to the fire. Two common dangers during this stage are first—the existence of non-flaming combustibles that can potentially start a new fire if not fully extinguished. Second, there is the danger of a backdraft when oxygen is reintroduced to a volatile, confined space.

Fire Risk Categorization by Type of Fire

The relatively low frequency of fire related events requires the TFD to rely more on the consequence and impact of the events more than the probability of the event occurring. The consequence factor is used to determine the number and type of apparatus and personnel initially dispatched to the fire incident. For example, a reported house fire could result in the loss of life or property; therefore, an initial dispatch of 16 personnel on 2 engines capable of flowing 3000 gpm, 1 truck, 2 rescues, and a commander vehicle will be sent. A trash can fire that is not threatening to spread to an exposure will only receive an initial dispatch of 1 engine company with 4 personnel. The below categories indicate the initial fire risk level so units can be properly dispatched:

Low Risk: Exterior trash fire, automatic fire alarms with no water flow alarm, grass or brush fire not threatening a structure, vehicle fire.

Moderate Risk: Aircraft fire, vehicle fire with entrapment, exterior fire with a hazardous material potential (example, ruptured natural gas line)

High Risk: All structure fires

Special risks: Hazardous materials fires, refinery fire responses, Mutual Aid Request from region 1

In order to maintain the acceptable distribution and concentration of resources, the TFD does not use the occupancy risk as a basis for determining the number and type of fire apparatus dispatched during a reported structure fire. The TFD deployment model dispatches a 1st alarm structure response to all reported structure fires regardless of the occupancy type. For years 2015-2017 TFD was dispatched to 484 structure fires. Over the same time period, the TFD only had 99 structure fires as a final disposition of the event. Public Safety Dispatchers often have limited information during the initial stages of an event resulting in many structure fire responses being downgraded. All structure fire responses that have a confirmed fire or multiple callers are upgraded to a 2nd alarm structure response.

Occupancy Risk Levels

While all structure fires are considered high risk, the department has further identified fire risk levels for each type of occupancy within the City of Torrance. The risk levels are primarily assigned based upon the potential impact or consequence as the result of fire.

The purpose of TFD assigning occupancy risk levels to determine the proper personnel to conduct the annual life safety inspections (previously referred to as fire prevention inspections). Low and moderate risk level occupancies do not require the same level of expertise as the high and special risk occupancies. As a result, the high and special risks occupancies are assigned to the Community Risk Reduction Division (CRRD) for annual fire prevention, NPDES, underground tank, and other specialized inspections. CRRD Senior Fire Inspectors are the only personnel that inspect high rise buildings and California Accidental Release

Prevention (CalARP) program facilities due to the technical expertise required. The operations division personnel are limited to conducting Life Safety Inspections, NPDES, and Hazardous Materials Inventory inspections in the low and moderate risk occupancies. The TFD risk reduction fees are based on the time required to complete the inspection and any special permits required, not on the occupancy risk classification.

Moderate Risk	High Risk
-Business Occupancies without fire sprinklers -Mercantile occupancies without fire sprinklers -Factory occupancies without fire sprinklers -Laboratories with fire sprinklers -Mid– Rise buildings (3 stories to below 75') -Assemblies with fire sprinklers - CERS facilities -Storage	- Hospitals -Educational -Senior Living Facilities -Institutions -Lab/Factory without fire sprinklers -High Rise -Assemblies without fire sprinklers Covered/open malls -Hazardous Occupancies
Low Risk	**Special Risk**
-Business occupancies with fire sprinklers -Mercantile occupancies with fire sprinklers -Utility/Misc. -Residential with fire sprinklers	-Residential without fire sprinklers -CalARP facilities -Vacant/Abandoned buildings -Governmental buildings/infrastructure

Figure 77: Occupancy Risk Levels

Occupancy Special Risks

CalArp Facilities- These facilities are regulated under the California Accidental Release Prevention (CalARP) program. The purpose of the CalARP program is to prevent accidental releases of substances that can cause serious harm to the public and the environment, to minimize the damage if releases do occur, and to satisfy community right-to-know laws. This is accomplished by requiring businesses that handle more than a threshold quantity of a regulated substance listed in the regulations to develop a Risk Management Plan (RMP). An RMP is a detailed engineering analysis of the potential accident factors present at a business and the mitigation measures that can be implemented to reduce this accident potential. These facilities are only inspected by Senior Fire Inspectors.

Residential properties without sprinklers- According to 2015 statistics from the US Fire Administration, "Residential" is the leading property type for fire deaths (75.0%), fire injuries (78.0%) and fire dollar loss (52.1%). Since 2012, TFD has experienced 3 civilian fatalities and 6 civilian injuries as a result of structure fires. All fatalities and 5 of the injuries occurred in residential properties without sprinklers. Currently, TFD

does not perform any form of residential fire prevention inspection; however, it is an area of concern that requires a multi-pronged approach to risk reduction.

Vacant/Abandoned buildings- Vacant and abandoned buildings are often used for illegal activity or shelter for the homeless. This presents an increased risk of fire due to unregulated fires used for cooking and warmth. Firefighters are strongly encouraged to alter their strategy and tactics in vacant and abandoned buildings to reduce their risk profile. Risking firefighter's lives to save a vacant or abandoned building is considered unacceptable in the TFD.

Governmental buildings/Infrastructure- These facilities are considered essential to providing services or direction during the response to an emergency or during the recovery period.

Fire Sprinklers

According to a report published by the NFPA in August 2005 when sprinkler systems operate they are effective in 96% of the incidents. Since the 2005 report, more recent studies have indicated that the operational reliability of automatic sprinkler systems may be decreasing. However, the decrease in effectiveness may be due to more accurate data collection and analysis. Even with improved data, the operational reliability of sprinkler systems may be as high as 93%.

A key component in the 2010 California Building Standards Codes code adoption is the addition of residential fire sprinklers in all new one and two-family dwellings and townhouse construction statewide. For many years, installation of fire sprinkler systems has only been required in office buildings and multi-family dwellings (i.e. apartments). These sprinkler systems are proven to save lives and extinguish fires. All new construction and remodels over 1000 square feet require fire sprinklers in the City of Torrance. The impact of the new requirement on the TFD will take many decades to fully realize. While residential fire sprinklers save lives, there are some important factors that the TFD needs to consider when educating the community.

- Residential fire sprinklers do not cover the entire structure like similar systems installed in commercial occupancies. In residential units there are no fire sprinklers in the atticspace.
- Fire sprinkler systems are designed to keep fire contained long enough to allow occupants to exit, not fully extinguish the fire. A fire department response is stillneeded.
- Installing both smoke alarms and a fire sprinkler system reduces the risk of fire death by 82%.
- Sprinkler systems allow quicker control and extinguishment by the fire department and less time committed for overhaul.
- Smoke alarms do not activate the sprinklers.
- Only the sprinkler heads activated will flow water, not every sprinkler in the home will be activated by a fire in one room.
- Over time, sprinkler systems will lower property loss ($) due to fire, which will have a positive effect on residential fire insurance premiums citywide.
- Sprinkler systems do not lessen the need for fire stations (distribution), but will lessen the need for multiple units responding from the same stations (concentration).

Home fire sprinklers are affordable, reliable, and require little or no maintenance. The following are myths:

- A smoke alarm provides enough protection.
- Newer homes are safer homes; the fire and death problem is limited to older homes.
- When a fire occurs, every sprinkler will activate and everything in the house will be ruined.

Risk Impact of Fire Sprinklers

The following is reported data collected by The National Fire Protection Association (NFPA). The civilian fire death rate of 0.8 per 1,000 reported fires was 87% lower in properties with sprinklers than in properties with no AES.

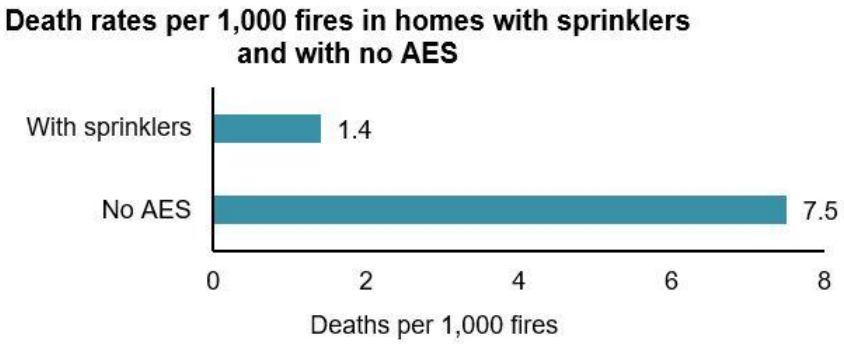
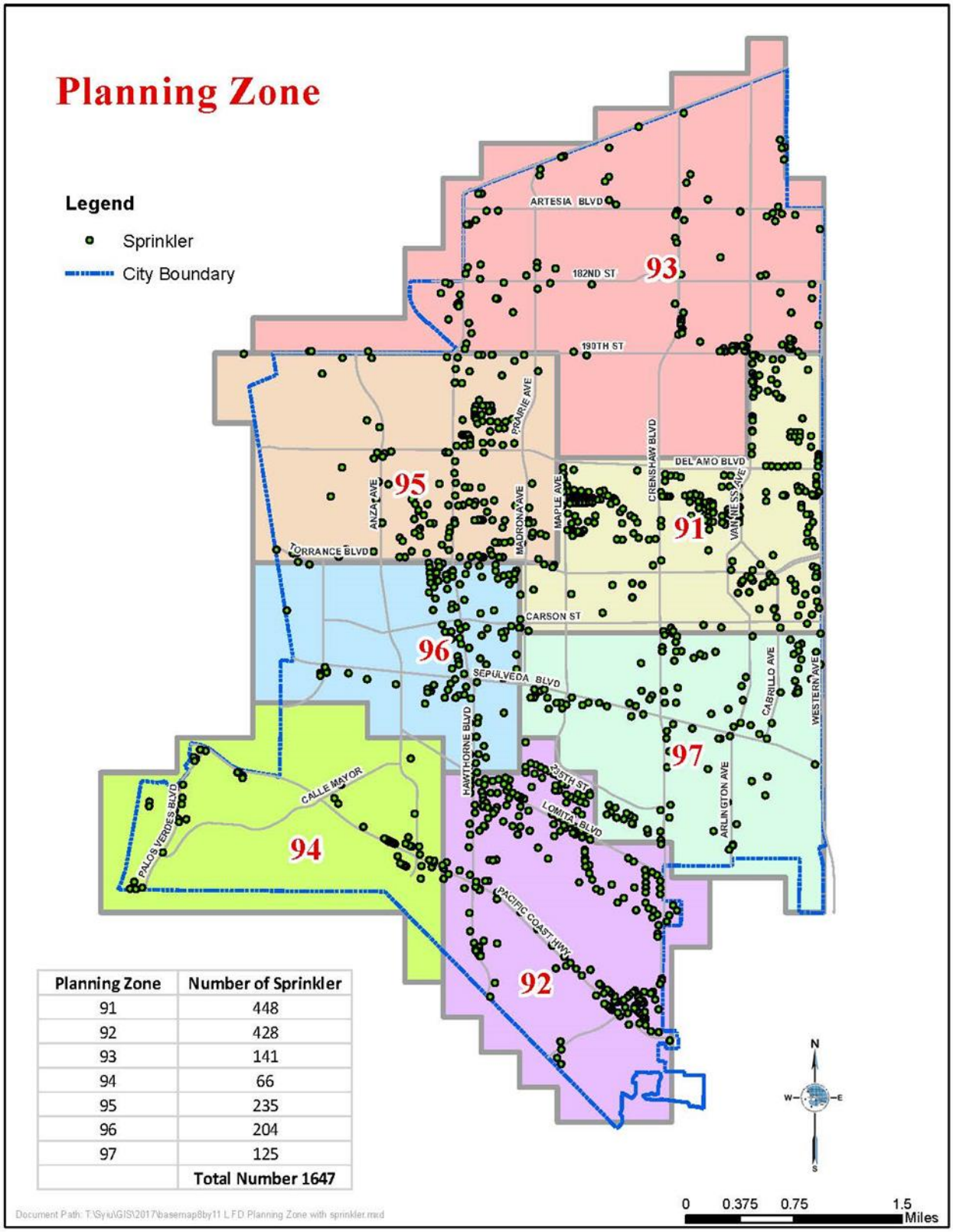


Figure 78: Fire Death Rates per 1000 fires in homes with sprinklers and with no AES Source: NFPA - "U.S Experience with Sprinklers" – Marty Aherns – 2017

Additionally, the civilian injury rate of 23 per 1,000 reported fires was 27% lower in properties with sprinklers than in properties with no AES. Many injuries occurred in fires that were too small to activate the sprinkler or in the first moments of a fire before the sprinkler operated. The average firefighter injury rate of 20 per 1,000 reported fires was 67% lower where sprinklers were present than in fires with no fire sprinklers.

The TFD requires residential remodels over 1000 square feet and commercial tenant improvements to include fire sprinklers. As a result, since 2015, 48 permits for residential fire sprinklers have been issued. Additionally, Torrance has records of 1647 business occupancies with automatic fire sprinklers installed. The TFD is committed to working cooperatively with residents, business owners, developers, and other City departments to increase the installation of automatic fire sprinklers. The map on the following page indicates all automatic fire sprinklers installed in non-residential occupancies within the City of Torrance broken down into planning zones.

Fire Sprinkler Location Map



Planning Zone	Number of Sprinkler
91	448
92	428
93	141
94	66
95	235
96	204
97	125
	Total Number 1647

Figure 79: COT Fire Sprinkler Location Maps

Hazardous Material Hazard Assessment

The use, storage, and transportation of hazardous materials and wastes are areas of great importance to the protection of life, property, and the environment in the City of Torrance. The prevalence of businesses and residents routinely storing and handling hazardous materials and waste have necessitated an increased awareness and concern for the community's health and safety. The risks associated with hazardous materials results in responsibilities for businesses and emergency responders. As a result, TFD has a Hazardous Materials Area Plan that complies with the State of California's Health and Safety Code Chapter 6.95 for implementing a hazardous materials emergency response program.

The purpose of the TFD Hazardous Materials Area Plan has three purposes.

1. It serves the TFD as a planning guide outlining actions required by the TFD to protect the community from threatened releases. The plan, in conjunction with department operating guidelines, delineates the organization and responsibilities of the fire department during pre-emergency planning and emergencies.
2. The Area Plan provides businesses with response planning and guidance to assist them in establishing their level of response for any size of release their business can safely handle.
3. The Area Plan serves as one aspect of the SARA Title III "Community Right to Know" law that allows the community the right to know about chemicals hazards in the community and how the City plans for such emergencies.

In addition to the Torrance Hazardous Area Plan, the California Accidental Release Prevention (CalARP) program was implemented to prevent accidental releases of substances that can cause serious harm to the public and the environment, to minimize the damage if releases do occur, and to satisfy community right-to-know laws. This is accomplished by requiring businesses that handle more than a threshold quantity of a regulated substance listed in the regulations to develop a Risk Management Plan (RMP). A RMP is a detailed engineering analysis of the potential accident factors present at a business and the mitigation measures that can be implemented to reduce this accident potential. The RMP contains:

- Safety information
- A hazard review
- Operating procedures
- Training requirements
- Maintenance requirements
- Compliance audits
- Incident investigation procedures

Hazardous Materials Inventory in Torrance

The table below includes the CalARP chemicals present in regulated quantities in Torrance:

Cal Arp Regulated	Chemicals in Torrance
Anhydrous Ammonia	Propane
Pentane	Hydrazine
Chlorine	Butane
Acrylonitrile	Vinylacetate

Figure 80: CAL ARP Regulated Chemicals in Torrance

The following Table list the CalARP regulated facilities within the City of Torrance.

Business name	Address
Americas Styrenics	305 Crenshaw Blvd.
Arconic Global Fasteners	3000 Lomita Blvd.
Arkema Coatings Resins	19206 Hawthorne
Bachem	2132 Kashiwa
Hi Shear Corporation	2600 Skypark Dr.
Honeywell Aerospace	2525 190th
Linde LLC	2535 Del Amo Blvd.
Moog	20263 Western Ave
Preston Products	19500 Mariner
Torrance Refining Company	3700 190th St.

Figure 81: CAL ARP Regulated Facilities in Torrance

In addition to CalARP, Torrance has other businesses that are required to report to the California Environmental Reporting System (CERS) due to reportable quantities. The below table lists the other hazardous materials reportable programs and the number of facilities regulated in the City of Torrance.

Program Element	Total Regulated Facilities
Hazardous Materials Release Response Plans (HMRRP)	420
Underground Storage Tank (UST)	60
Hazardous Waste Generator (HW)	414
Hazardous Waste Resource Conservation and Recovery Act (RCRA) Large Quantity Generator (RCRA LQG)	39

Figure 82: Hazardous Materials Program Elements for CERS

Hazardous Materials in Transit

Hazardous Materials are transported through the city in four primary modes: highway and road, railway, pipeline, and air. The hazardous commodities moving through the city are not necessarily used within the city limits; however, they still present a significant daily risk for a hazardous materials emergency.

Highways/Roads

The City of Torrance has one major freeway, the 405 San Diego Freeway. The freeway runs northwest and southeast on the northern portion of the city. The freeway is designated as a hazardous materials transportation corridor by the California Highway Patrol (CHP). In addition to the 405, several major streets in Torrance serve as truck routes including Hawthorne Blvd., Western Ave. and Crenshaw Blvd. in the north-south direction and Sepulveda Blvd., Artesia Blvd., Carson St., Pacific Coast Highway, and 190th St. in the east-west

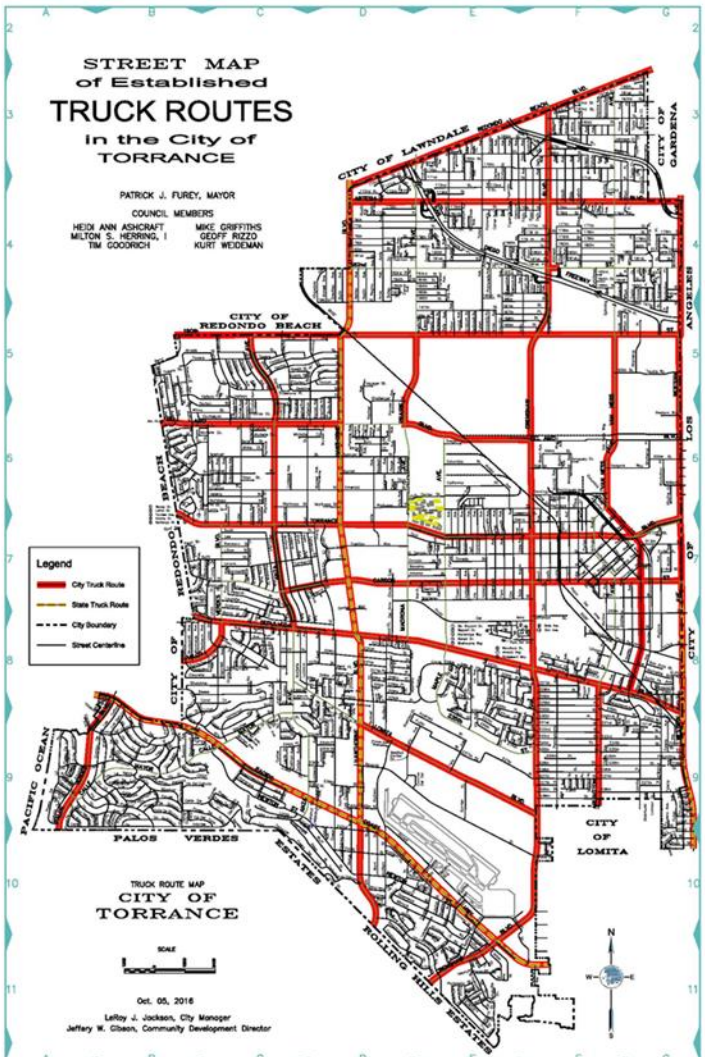


Figure 83: Truck Routes in the City of Torrance, Map

direction. The majority of hazardous materials are transported in and through Torrance using the surface streets. See the truck route map below:

Railway

There is one major rail line that runs diagonally through the city. This is the Burlington Northern Santa Fe Railroad line. The rail activity has decreased dramatically since the Alameda Corridor has been in operation out of the Port of Los Angeles. The rail does supply a few larger handlers of hazardous materials in Torrance and hauls raw materials north to El Segundo. The rail line transports 43 known commodities; however, for security

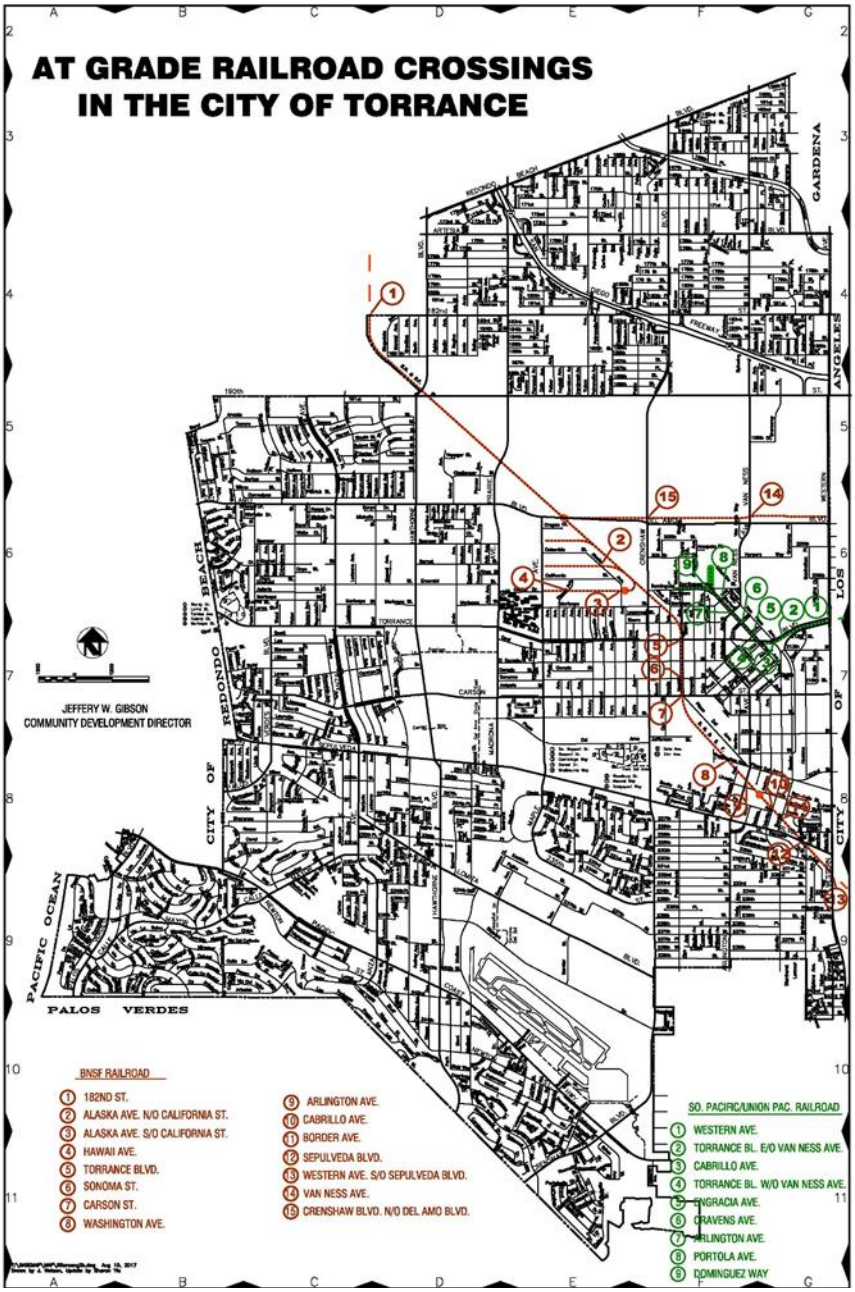


Figure 84: City of Torrance Railroad Crossing Map

reasons the hazardous material commodity list is not available for listing in this public document. The map below shows the railway and the crossings that can affect response times east of the railway.

Pipeline

The City of Torrance has a number of identified underground hazardous materials pipelines. These pipelines are typically operated at high pressures (300-600 psi) and transport refined and unrefined petroleum products and natural gas. The lines are typically 42" below grade. Due to the city's significant history as an oilfield, the potential exists for unmapped or abandoned pipelines, although there is a very low probability of there being unknown pressurized transmission lines. The map to the right shows the location of major known pipelines.

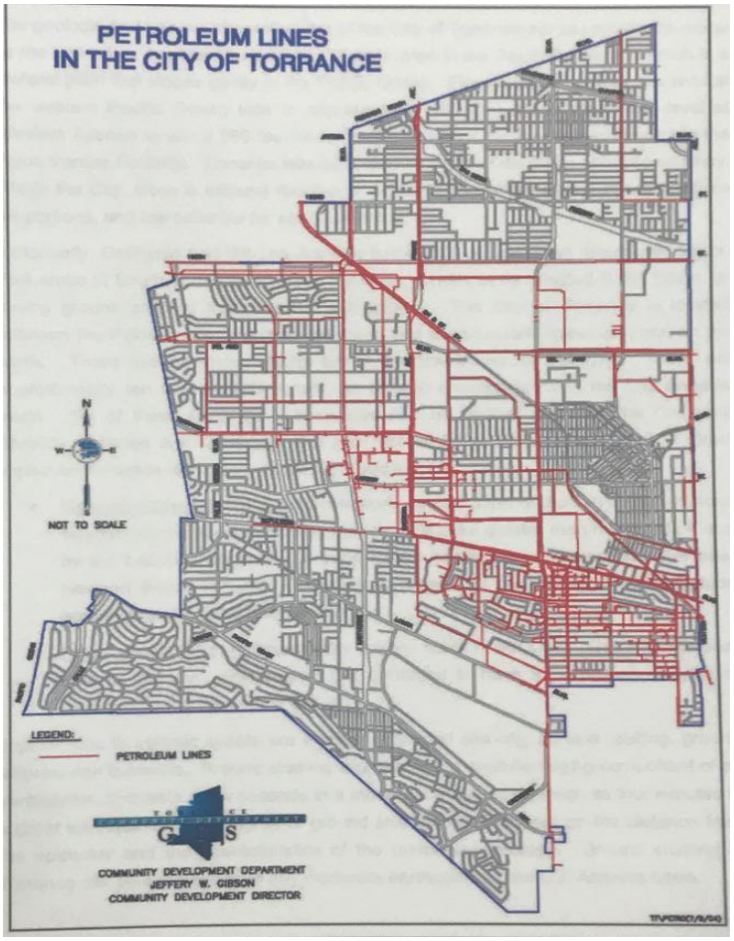


Figure 85: Petroleum Lines in the City of Torrance

Air

The Los Angeles County airspace is among the busiest in the nation. Torrance is located approximately 4 miles south of Los Angeles International Airport and the flight landing pattern. Hazardous materials may be transported by air over the city and there is a very low probability of a plane crashing resulting in a hazardous material release. The Torrance Municipal Airport does not pose a hazardous materials threat under normal conditions.

Hazardous Materials Vulnerability Assessment

Hazardous material facilities, particularly those used to support industrial operations, are frequently found in neighborhoods with a greater number of lower-income households or otherwise disadvantaged individuals. It is unknown whether Torrance's hazardous material facilities are located in these neighborhoods, although all residents near hazardous material facilities face an increased risk to this hazard regardless of socioeconomic conditions.

Torrance has 17 critical facilities located near hazardous material facilities. These critical facilities, which have an increased risk of hazardous material–related emergencies, provide a wide range of functions. The types and priorities of critical facilities near hazardous material facilities, as well as their distance to the nearest hazardous material facility, are shown in the table on the next page.

Facility Type	Number of Facilities at Risk				
	Within 100 Feet			Within 1,000 Feet	Not at Risk
	Priority 1	Priority 2	Priority 3	Priority 1 *	
Bridges	0	2	0	0	12
Government facilities	1	1	0	1	41
Schools	0	7	0	0	38
Transportation routes	0	0	0	0	2
Utilities	0	2	3	0	25
Total	1	12	3	1	118

Figure 86: Number of Torrance Facilities at Risk

One significant hazardous material risk to Torrance is a plant that stores and uses 90-ton chlorine railcars located ¼ mile east of Western Avenue and Del Amo Blvd. The plant brings in the railcars and transfer the product to trucks and smaller cylinders for industrial uses in the Los Angeles basin.

While data can be broken down a variety of ways, hazardous materials risk assessment calls are grouped as Hazardous Material events and odor complaints. Hazardous Materials CAD call natures include vehicles leaking fluids, carbon monoxide leaks, hazardous releases and leaks, unknown substances, and hazardous and unknown spills. The chart to the right shows the community demand related to hazardous materials for years 2015-2017. Natural gas emergencies that occur outside are classified as a utility hazard.

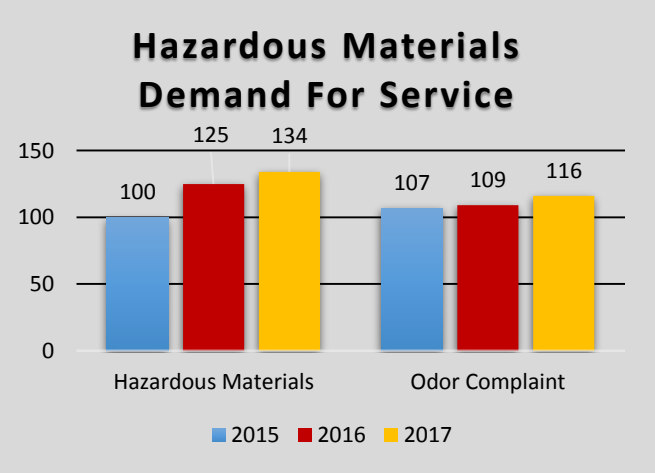


Figure 87: Hazardous Materials Demand for Service Historical Data 2015-2017

In addition to hazardous materials hazards, TFD conducts National Pollution Discharge Elimination System inspections at facilities that are potential polluters of navigable waterways. The TFD program targets nurseries, industrial facilities, automotive repair facilities, and restaurants to ensure compliance with best management practices. The chart located to the right shows NPDES activity within the TFD for calendar years 2015-2017. These inspections are completed biennially, with even addresses inspected during even years and odd addresses being inspected during the odd years.

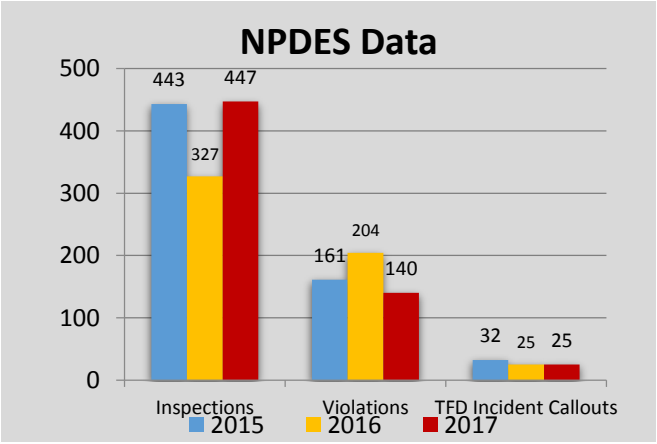


Figure 88: NPDES Data Historical Data 2015-2017

Hazardous Materials Risk Categorization

Based on historical data, the TFD staff completed analyses for the probability and consequence of hazardous materials events. In this case, the risks for hazardous materials are greater than the historical experience. Therefore, the consequence and impact portions of the matrix had greater influence on the risk classification than the probability. All hazardous materials events are relatively low frequency as compared to other community service demands but the consequence of events could be significant. A probability and consequences risk matrix was developed and is presented below.

Low Risk: Odor complaints, spills or leaks that do not impact public health, abandoned containers, vehicle fluid spills, refinery report only (these do not get a dispatched piece of apparatus), NPDES call outs that do not reach the storm drain or waterway.

Moderate Risk: Illegal dumping, significant environmental impact events, NPDES calls that reach the storm drain or waterway.

High Risk: Active leak that is impacting public health. Any hazmat event that requires a rescue of people in the exclusion zone. Hazmat with fire. Any event requiring offensive action in the exclusion zone.

Special Risks: Any incident that requires the use of mutual aid hazmat teams. Examples would include train derailments, active gas leak that is affecting the public's safety.

Moderate Risk -Illegal dumping -Significant environmental impact -NPDES callouts that reach storm drain/waterway	**High Risk** -Public health impacting leak -Hazmat with fire -Hazmat event requiring rescue of people/offensive action in exclusion zone
Low Risk -Odor complaints -Spills/leaks that do not impact public health -Abandoned containers -Vehicle fluid spills -Refinery report only (these do not get a dispatched piece of apparatus) -NPDES call outs that do not reach the storm drain/waterway.	**Special Risk** - Requires use of mutual aid hazmat teams -Train derailments - Active gas leaks affecting public safety

Figure 89: Hazardous Materials Risk Categorization

Security Hazard Profile

Security Hazard Description

In today's fire service, violent activity responses are becoming more common. These violent activities to which firefighters respond can include bomb threats, shootings, stabbings, domestic violence, gang violence, civil unrest, assaults, suicides, hostage situations, and terrorism. These security hazards can impact the socio-economic environment of the community and have a major effect upon the population.

Security Hazard Risk Categorization

Similar to other hazard profiles that have a relatively low probability, the consequence and impact of the risk matrix had greater influence on the risk classification than the probability. Security events are relatively low frequency as compared to other community service demands but the consequence of events could be significant. Using the risk matrix for security hazards, the below categories indicate the initial security risk level:

Low Risk: Man down-unknown reason, police stand-by, assaults with TPD on scene, and suspicious powders with no credible threat

Moderate Risk: Shooting, stabbing, domestic violence, assaults when TPD is not on scene, and suicide or suicide attempts

High Risk: SWAT/TEMS activation, suspicious powders with credible threat, bomb threat, and hostage situations

Special Risks: Acts of terrorism, civil unrest, and active shooter or violent act

Moderate Risk	High Risk
-Shooting -Stabbing -Domestic violence -Assaults when TPD is not on scene -Suicide or suicide attempts	-SWAT/TEMS activation -Suspicious powders with credible threat -Bomb threat
Low Risk	**Special Risk**
-Man down-unknown reason -Police stand-by -Assaults with TPD on scene -Suspicious powders with no credible threat	-Acts of terrorism -Civil unrest -Active shooter or violent incident - Hostage situation

Figure 90: Security Hazards Risk Category

The low risks and moderate risk security incidents are initially dispatched a single rescue and engine company. The one exception to this dispatch protocol is a suspicious white powder incident. These incident are first investigated by TPD unit and if assistance is needed to further identify the powder, a hazmat response may be dispatched.

The high and special risks are the areas of significant concern and focus of training and preparation within the operations division of TFD. TFD sends specially trained Tactical Emergency Medical Support (TEMS)medics with every SWAT callout. Suspicious powders with a credible threat result in outside consultation with experts from police, FBI, and public health as a minimum. Bomb threats and hostage situations would receive a Chief Officer to establish a Unified Command with TPD plus an engine and/or an engine and a rescue.

Terrorism- Torrance is located in Southern California and in many ways embodies the values of America. Numerous factors make Torrance a potential target for both domestic and international terrorist attacks: population, industrial infrastructure, large retail shopping center, and the City's commitment to supporting the armed forces. Torrance is also becoming a transportation hub by building a regional transit center that will serve the greater Los Angeles area. The city also has a cargo rail line, municipal airport and a major freeway that supports statewide commerce and travel.

The Torrance Police monitor the tracking of the City's infrastructure identified as being possibly vulnerable to attack by domestic or foreign-born terrorists, which can change over time. This information is shared internally with the TFD. Additionally, all TFD Hazardous Materials Captains are trained Terrorism Liaison Officers (TLO). This training helps TFD personnel maintain situational awareness regarding terrorism-related alerts, requests for information, warnings, and other notifications from regional, state, or federal homeland security agencies.

Civil Unrest- The potential for civil unrest originating in Torrance is considered very unlikely; however, the potential for civil unrest in LA County that could negatively impact the Torrance area is more plausible. Civil unrest is generally a police issue, but associated events may require the assistance of TFD. Medical aid, fire suppression, TEMS, and hazardous materials response are areas of assistance that may be necessary if the unrest escalates. Torrance has supported adjacent jurisdictions' efforts by responding to mutual aid requests to handle the fires as a result of civil unrest. Areas of concern in Torrance are venues such as the Courthouse, Civic Center, and Del Amo Fashion Center, where large groups congregate and emotions or inappropriate behavior can change the focus and demeanor of the crowd.

Active Shooter- Active shooter scenarios can occur anywhere at any time; therefore, it is critical the TFD not exclude any facility or area of the city from this threat assessment.

A review of dispatch data from years 2015-2017 indicates that approximately 20% of all TFD calls for services include a law enforcement unit. These incident types include traffic accidents, welfare checks, man down for unknown reason, and other non-violent incidents. A very small fraction of these law/fire calls are for violent incidents

TEMS- The TEMS program was established in the second half of 2014; however, it was not until 2016 that the team kept detailed records of deployments.

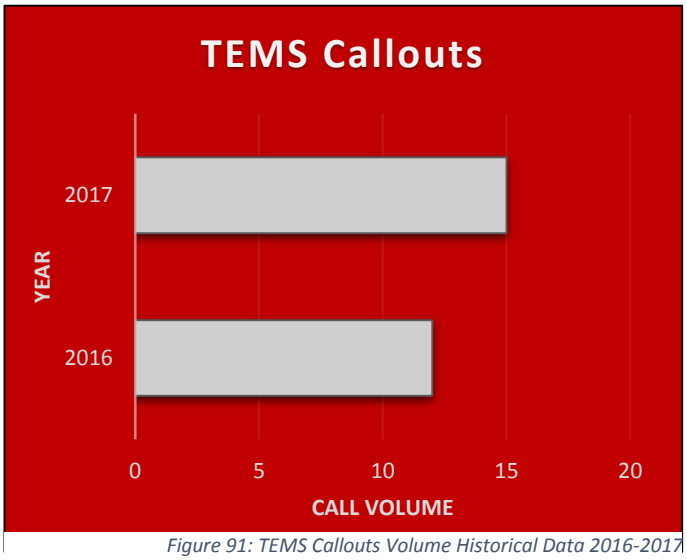


Figure 91: TEMS Callouts Volume Historical Data 2016-2017

EMS Hazard Profile

Requests for Emergency Medical Services (EMS) are the most frequent type of service provided by the Torrance Fire Department. EMS incidents account for 72% of emergency activities and correspondingly have the greatest impact on the concentration and distribution of TFD resources. The residential and daytime population are significant factor in assessing the probability of EMS incidents. Additionally, as the population of the Torrance increases and ages, the demand for EMS will increase proportionately. In many cases the increased population is an elderly demographic due to the access to healthcare and property developers building high density housing for the senior community. The following charts indicate the community EMS demand for services broken down into more specific chief complaints grouped by medical or trauma. All the data reported in the charts are the result of a patient care report being filled out and turned into the Los Angeles County Emergency Medical Services Agency. This data accounts for 35,944 patient care reports including 28,410 medical complaints and 7,534 trauma complaints. Medical requests that require a patient care report account for 79% of all EMS complaints. Trauma calls account for 21% of all EMS complaints.

Types of EMS Trauma Contacts 2015-2017	
FA Fall	3601
EV Enclosed Vehicle (including SB, AB, CS, EX, PS, 12, 18)	1918
AS Assault	415
PB Ped/Bike Less Than 20 MPH	330
SP Sports/Recreation	257
SA Self Inflicted Accidental	282
OT Other	203
SI Self Inflicted Intentional	71
20 Impact More Than 20 MPH (Unenclosed Vehicle)	86
MM Motorcycle/Moped	69
WR Work Related	76
UN Unknown	60
RT Ped/Bike Thrown/Run over/Impact Greater Than 20 MPH	82
AN Animal Bite	34
ST Stabbing	23
GS GSW	9
ES Electrical Shock	5
CR Crush	6
TB Thermal Burn	7
Total	7534

Figure 92: EMS Trauma Contacts Historical Data 2015-2017

Significant Findings

- 47% of all patients with a trauma complaint from 2015-2017 were the result of a fall. These do not include falls or citizen assists that are coded “assist invalid” in the NFIRS report and do not have a patient care report completed.
- 25% of all patients with a trauma complaint from 2015-2017 were the result of a traffic accidents

Types of EMS Medical Contacts from 2015-1017	
WE Weak	3857
AL Altered Loc	2384
OT Other	2362
EH Behavioral	2213
SB Shortness of Breath	2064
AP Abd/Pelvic Pain	2026
NV Nausea/Vomiting	1676
CP Chest Pain	1408
OP Other Pain	1399
SY Syncope	1330
SE Seizure	924
DI Dizzy	880
CC Cough/Congestion	683
NC No Medical Complaint	609
LN Local Neuro Signs	518
HP Head Pain	414
DO DOA	401
NB Neck/Back Pain	387
DY Dysrhythmia	357
FE Fever	353
CA Cardiac Arrest	334
HY Hypoglycemia	310
OD Overdose	290
GI GI Bleed	206
PS Palpitations	177
AR Allergic Reaction	157
OS Bleeding Other Site	151
CH Choking/Airway Obstruction	131
DC Medical Device Complaint	115
NO Nosebleed	102
VA Vaginal Bleed	45
PO Poisoning	42
OB Obstetrics	35
RA Respiratory Arrest	17
AD Agitated Delirium	17
LA Labor	13
TE Apparent Life Threatening Event	9
NW Newborn	8
FB Foreign Body	3
ND Near Drowning	3
Total	28,410

Figure 93: EMS Medical Contacts Historical Data 2015-2017

EMS Risk Categorization

TFD broadly categorizes, dispatches, and reports on EMS calls for service as either ALS or BLS. If there is any doubt about what risk level of a call based on inadequate or unclear information, then the highest level of care will be dispatched. In some instances, the initial dispatch criteria are either upgraded or downgraded from ALS to BLS or the opposite depending on the actual signs and symptoms of the patient. The following hazard levels have been established for EMS risk:

Moderate Risk	High Risk
•BLS patients including isolated injuries, falls, back injuries, lacerations, animal bites, fractures, eye problems, ill person, isolated head injury, and minor rescue	•ALS patients including allergies, allergic reaction, airway problems, burns, chest pain, cardiac arrest, drowning, diabetic problem, unconscious, man down, miscarriage, seizures, strokes, suicide attempts, and shootings.
Low Risk	**Special Risk**
•BLS Patients that are dispatched as "EMS-other" •DOA patients EMS-other type CAD nature	•Multi Victim Incidents •Active Shooter •Chemical exposure with airway, breathing, or circulation problems •All calls that place firefighters in harm's way

Figure 94: EMS Rick Categorization

Note- These risk categories are used by the dispatch center to send the correct number and type of resources; ultimately the responding personnel will determine whether or not the patient meets ALS or BLS criteria based upon the Los Angeles County EMS protocols.

Utility Hazard Profile

Utility Hazard Description

For purposes of risk assessment, TFD considers utilities to be electrical generation or distribution centers (critical facilities), electrical wires, communication equipment, natural gas outside a structure, and other forms of fuel equipment that are not considered a hazardous materials pipeline. The majority of the electrical supply in Torrance is run overhead on power poles, although there are many underground electrical vaults and surface mounted transformers. The following chart provided by American Community Survey shows the heating fuel used in homes in the City of Torrance.

OCCUPIED HOUSING UNITS BY HOUSE HEATING FUEL		
Total	55,377	100.0%
Utility gas	40,476	73.1%
Bottled, tank, or LP gas	557	1.0%
Electricity	13,235	23.9%
Fuel oil, kerosene, etc.	20	0.0%
Coal or coke	0	0.0%
Wood	118	0.2%
Solar energy	17	0.0%
Other fuel	50	0.1%
No fuel used	904	1.6%

Figure 95: Heating Fuel Used in Homes in the City of Torrance Source: American Community Survey

Utility Hazard Categorization

Low Risk: Low voltage or communication equipment failure. Water leak outside.

Moderate Risk: High voltage or 110/220/440 volt electrical wires or equipment down that does not appear to be energized. Natural gas leaks. Water leak inside a structure.

High Risk: High voltage or 110/220/440 volt electrical wires or equipment down that is obviously energized. Electrical emergency with fire involvement.

Special Risk: Electrical facility emergencies, electrical emergency with a rescue problem in a potential electrocution area.

Note: High and special risks require the Dispatcher, Platoon Commander, or first-in Company Officer to upgrade the resource request based upon situational awareness. Often times these incidents will receive a first alarm fire response.

Moderate Risk	High Risk
- High voltage or 110/220/440 volt electrical wires or equipment down that does not appear to be energized - Natural gas leaks -Water leak inside a structure.	- High voltage or 110/220/440 volt electrical wires or equipment down that is obviously energized -Electrical emergency with fire involvement
Low Risk	**Special Risk**
- Low voltage or communication equipment failure -Water leak outside.	-Electrical facility emergencies -Electrical emergency with a rescue problem in a potential electrocution area.

Figure 96: Utility Hazard Categorization

Technical Rescue Hazard Profile

Technical Rescue Hazard Description

Technical rescues include trench rescues, high and low angle emergencies, confined space emergencies, structural instability, structure collapse, and any other forms of rescue that require specialized training and/or equipment.

Technical Rescue are low frequency events compared to other community service demands and are often accompanied by a secondary hazard such as an earthquake, injured victim, utility emergency, etc. Despite the low frequency the consequences of the event could be significant. Many of these events are regulated by OSHA due to the elevated risks to the rescue workers. Using the probability and consequences risk matrix for technical rescue hazards, the below categories indicate the initial security risk level:

Technical Rescue Hazard Categorization

Low Risk: Child locked inside a vehicle, citizen concerns about structural stability, elevator entrapments

Moderate Risk: Overturned vehicle, vehicle into a building, TC with Entrapment

High Risk: Confined space rescue, trench collapse, high angle rescue, industrial accidents, building collapse and rope rescue.

Special Risk: Any high risk incident with multiple victims or multiple hazard categories such as fire.

Moderate Risk -Overturned Vehicle -TC with Entrapment - Vehicle into a building	**High Risk** - Confined space rescue - Trench collapse - High angle rescue - Industrial accidents - Rope rescue. - Building Colllapse
Low Risk - Child locked inside a vehicle - Citizen concerns about structural stability. - Elevator Entrapments	**Special Risk** - Any high risk incident with multiple victims or multiple hazard categories such as fire.

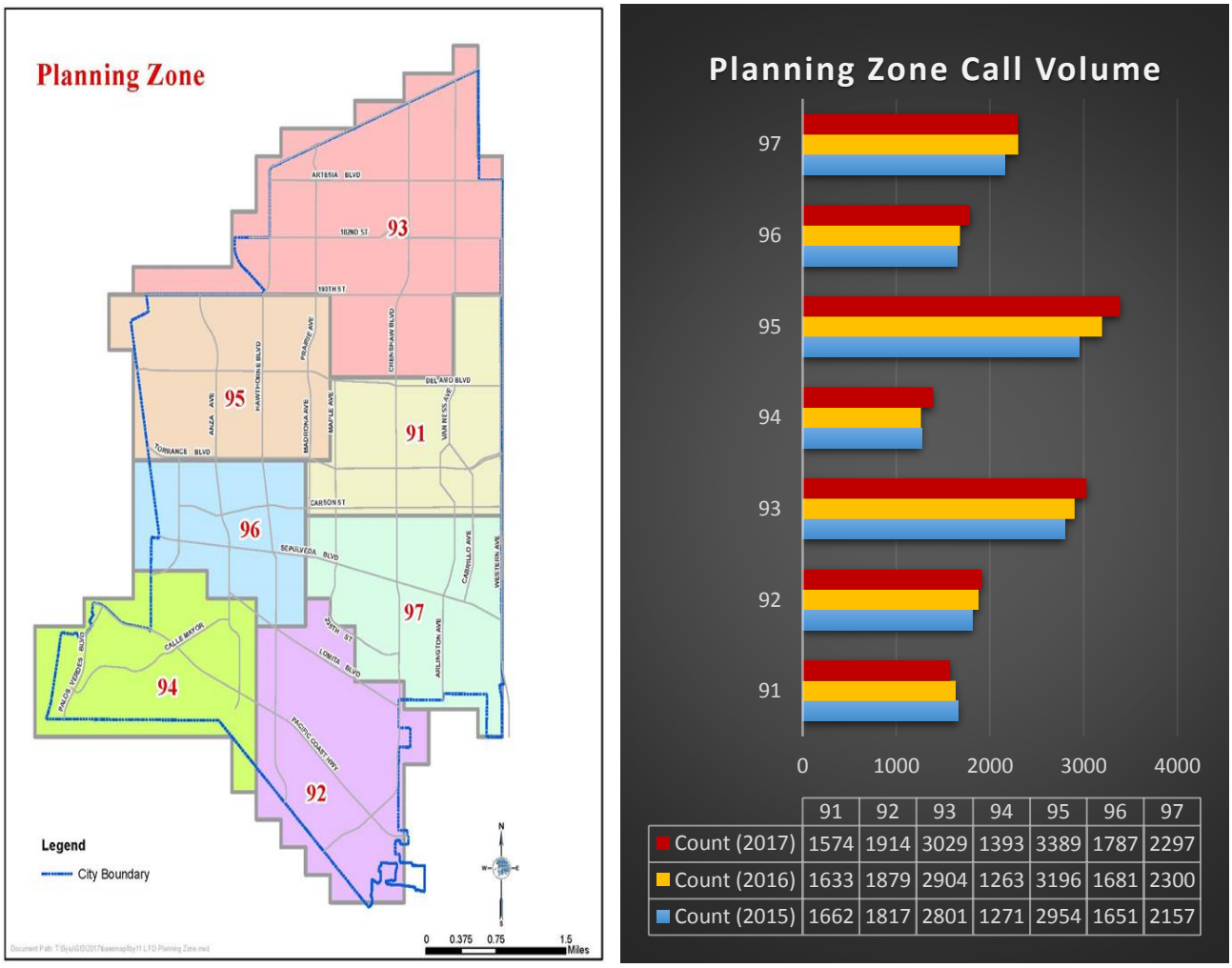
Figure 97: Technical Rescue Hazard Categorization

Geographical Planning Zones (First-in Districts)

Torrance is divided into seven geographical planning zones commonly referred to as “first-ins”. Each planning zone is served by a fire station and generally defines the first-due response area for each station when all units are in quarters. The number of the planning zone is reflective of the engine company that is housed within the area. For example, planning zone 93 houses Engine 93 at Fire Station 3. The 90 numeric is a specific Area mutual aid identifier indicating the apparatus is from the TFD.

The CAD system uses vehicle locators and GPS to dispatch the closest unit to calls for service; therefore, the first due areas change as apparatus move throughout the city to conduct business. Each fire station is located to ensure effective distribution of resources and limit undue risk from extended responses. Data on incident type, location and frequency is reviewed on an annual basis.

The planning zones range in size from 1.92 square miles to 4.77 square miles. The largest geographic planning zone is home to the refinery that sits on 750 acres. In addition to being strategically designed for resource deployment, the planning zones correspond to ¼ mile CAD quadrants, which allows the TFD to analyze the data related to each zone. The map below shows the planning zones.



	91	92	93	94	95	96	97
Count (2017)	1574	1914	3029	1393	3389	1787	2297
Count (2016)	1633	1879	2904	1263	3196	1681	2300
Count (2015)	1662	1817	2801	1271	2954	1651	2157

Figure 98: Planning Zones and Planning Volumes, Historical Data 2015-2017

Planning Zone 91

Planning Zone 91 (PZ91) is 2.67 square miles and is home to Fire Station 1, Honda Motors Corporation Headquarters and Historic Downtown Torrance. The downtown area presents unique risks due to some of the original buildings being built of unreinforced masonry prior to 1933. Many of these buildings have been retrofitted, however, they still present unique hazards in earthquakes or under fire conditions.

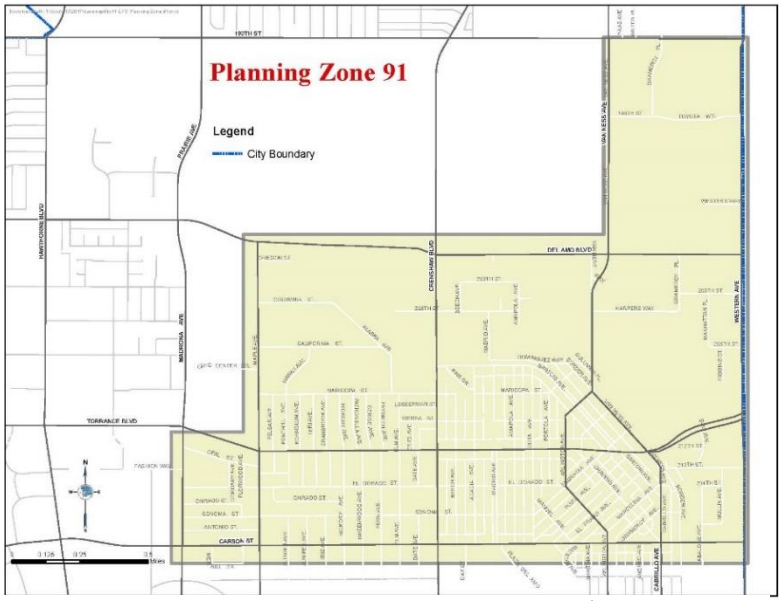


Figure 99: Planning Zone 91 Map

Large portions of the northeastern area in PZ91 are zoned for commercial and light industrial uses. This area is home to Moog Aerospace, Alpine Electronics, and a variety of other businesses that require manufacturing, office, and warehouse space. This area is slated for a major development project due to Toyota Motor Corporation selling their campus to a development group.

The area along Western Avenue is an industrial redevelopment project resulting in a transitioning out of heavy manufacturers and replacing these businesses with retail sales businesses, commercial office space, and hotels.

The central portion of PZ91 is generally commercial and manufacturing businesses with the exception of a residential neighborhood on Del Amo Blvd., between Crenshaw Blvd. and Van Ness Ave. The central area is home to American Styrenics, Airgas, Ganahl Lumber, and several businesses complexes with offices and warehouses.

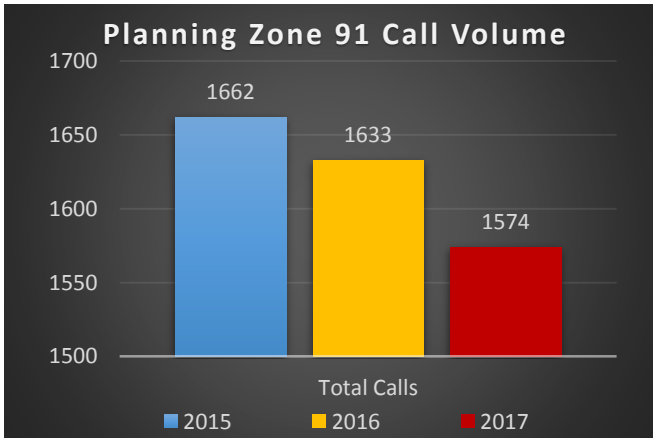
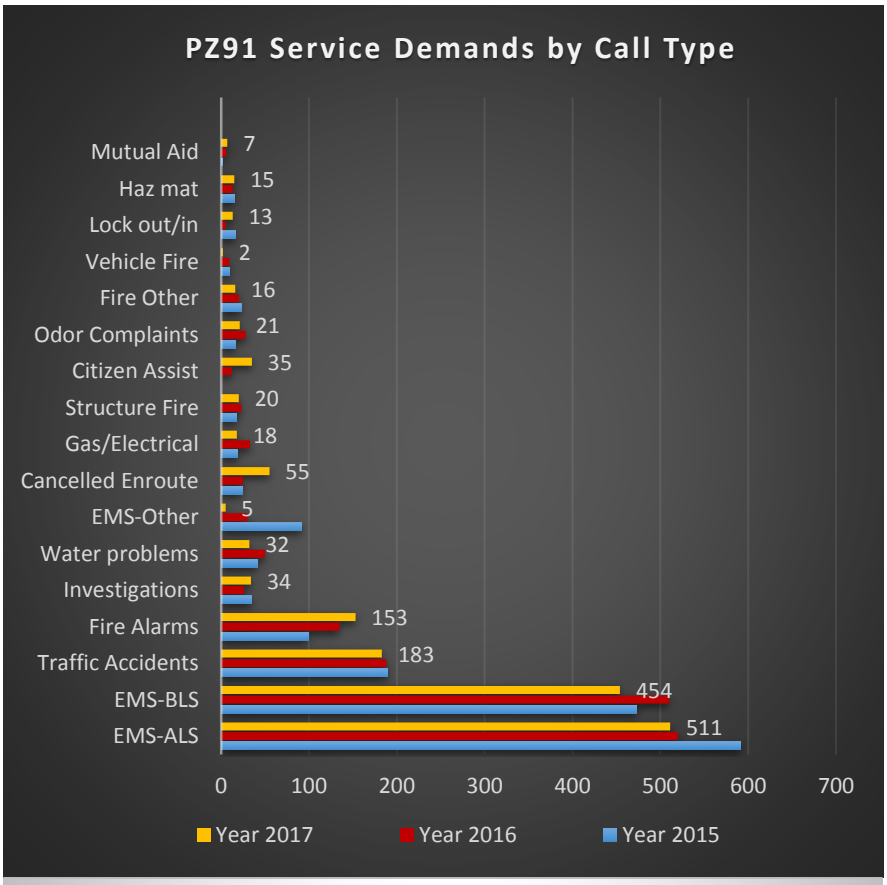


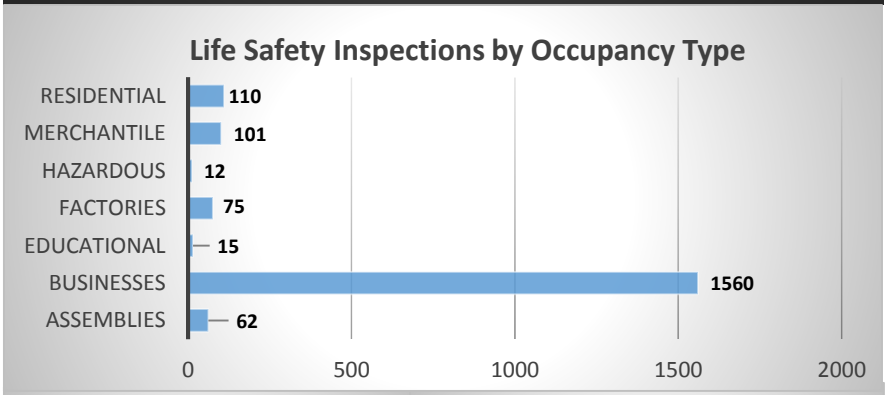
Figure 100: Planning Zone 91 Call Volume

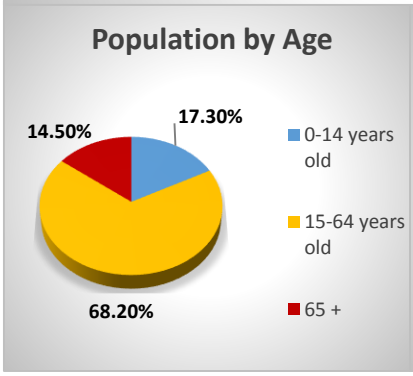
The bulk of the properties in the southern end of PZ91 are single family and multifamily residential properties. The residential population in PZ91 is estimated to be 11,089, making it the least populated residential zone. PZ91 is estimated to have 4,543 housing units with owners occupying 2,300 of the units. The median household income is $76,051 and the average income is $97, 543.

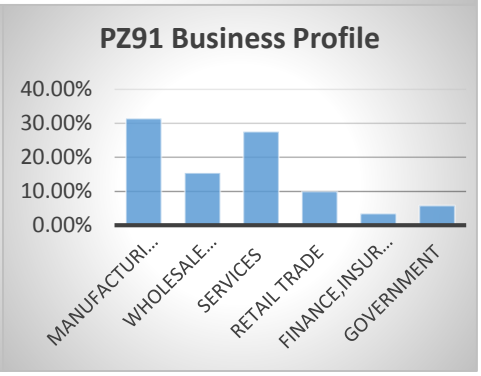
Significant hazards unique in PZ91 include CalARP facilities, a significant number of underground pipelines, the BNSF railroad and bridge over Crenshaw Blvd., and older buildings that were not built to modern building codes. The following graphs show the business profile, service demands by call nature, number of life safety inspections TFD conducts by occupancy type, call volume by hour, and population age chart for PZ91.

Figure 101: PZ91 Service Demands by Call Type, Call Volume by Hour, Life Safety Inspections by Occ. Type, Population and Bus. Profile









PZ 91 Call Volume by Hour

Hour	2015	2016	2017
0	38	32	36
1	28	31	22
2	27	35	19
3	34	23	18
4	33	32	23
5	29	30	27
6	42	44	47
7	48	70	67
8	80	88	71
9	85	87	80
10	107	92	88
11	102	92	104
12	103	103	109
13	106	98	98
14	124	105	91
15	115	89	96
16	88	92	79
17	93	114	97
18	89	74	90
19	85	82	80
20	59	58	62
21	56	66	58
22	50	46	60
23	41	50	52

Planning Zone 92

Planning Zone 92 (PZ92) is 2.84 square miles and is home to Fire Station 2, the Torrance Municipal Airport, and Torrance Memorial Medical Center. In addition, PZ92 is home to residential neighborhoods, commercial properties, large retailers, and car dealerships.

The area of PZ92 north of Lomita Blvd. is primarily manufacturing, hazardous, and commercial occupancies. This area is home to Pelican Products, Bachem, Union Oil tank farm, and a variety of other businesses that require manufacturing, office, and warehouse space. As a result, there is a significant risk related to hazardous materials and pipeline transportation.

The area between Lomita Blvd. and Skypark Dr. is a mix of occupancies including medical facilities, commercial properties, manufacturers, and big box retailers such as Sam's Club, Home Depot, Costco, and Lowes.

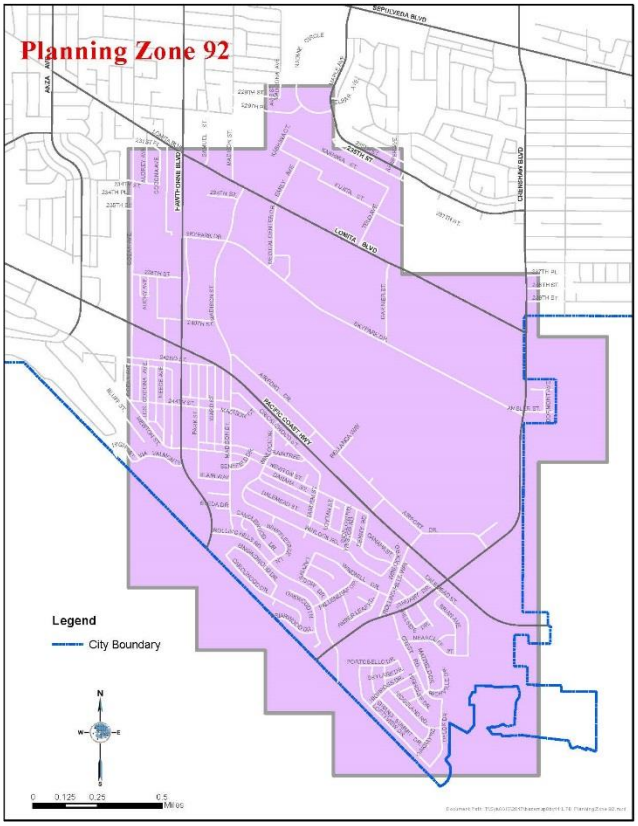
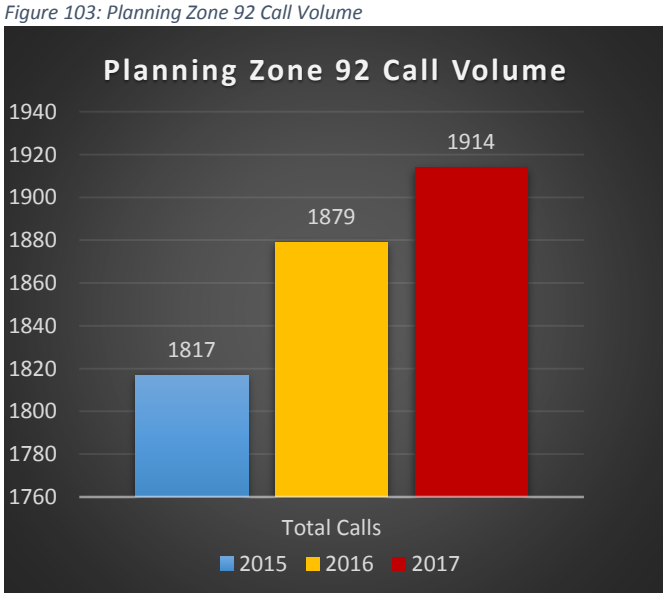


Figure 102: Planning Zone 92 Map

The central portion of PZ92 is occupied by the airport and a majority of the auto dealerships in the city. While the airport presents a unique piece of property with atypical hazards, the airport does not support large aircraft operations with the exception of special events. Robinson Helicopters headquarters, manufacturing, and testing facility is located on the airport property.

Figure 103: Planning Zone 92 Call Volume

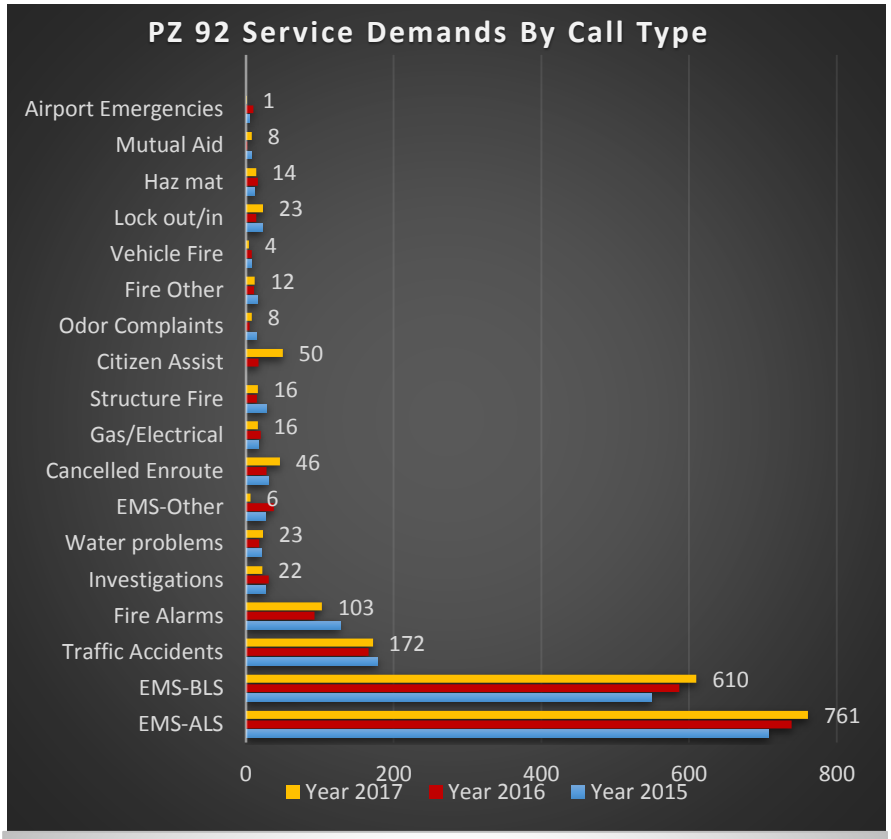


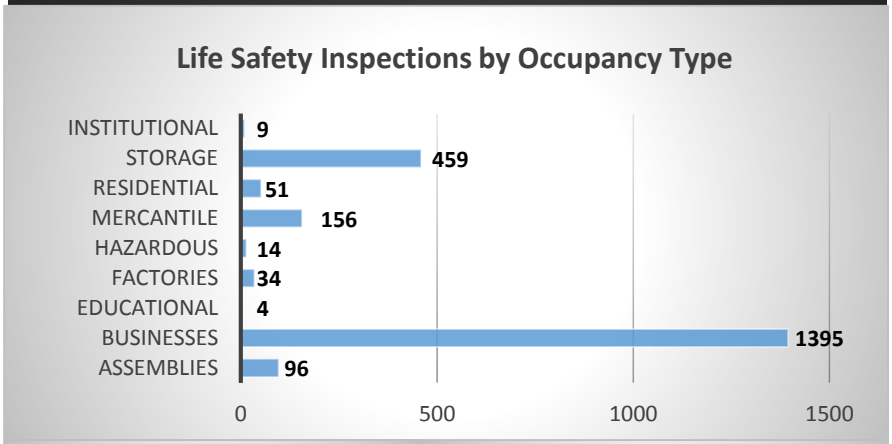
The bulk of the properties in the western and southern end of PZ92 are single family and multifamily residential properties. The residential population in PZ92 is estimated to be 11,868. PZ92 is estimated to have 4,931 housing units with owners occupying 53.2% of the units. The median household income is $79,128 and the average income is $99,420.

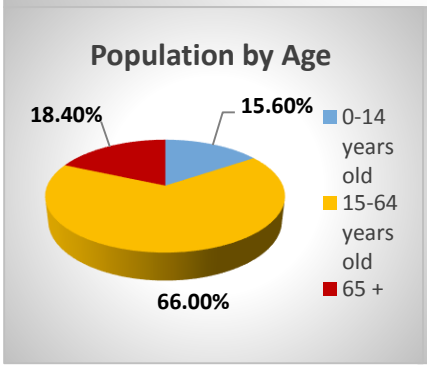
Significant hazards unique in PZ92 include manufacturing and hazardous occupancy facilities underground pipelines, the tank farm, the airport, a large mobile home complex for seniors, Torrance Memorial Medical Center and major transportation route including Crenshaw Blvd., Hawthorne Blvd., and Pacific Coast Highway.

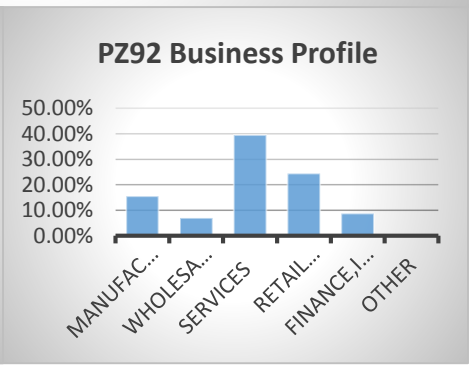
The following graphs show the business profile, service demands by call nature, number of life safety inspections TFD conducts by occupancy type, call volume by hour, and population age chart for PZ92.

Figure 104: PZ 92 Service Demands by Call Type, Call Volume by Hour, Occ. Type, Population and Business Profile









PZ 92 Call Volume by Hour

	2015	2016	2017
0	28	37	41
1	22	32	30
2	35	23	25
3	26	16	35
4	21	28	23
5	34	28	30
6	33	48	34
7	53	55	52
8	91	80	86
9	112	123	103
10	109	105	134
11	149	156	146
12	139	134	132
13	113	137	141
14	126	129	129
15	124	121	135
16	109	116	132
17	100	118	99
18	101	85	104
19	79	89	65
20	63	68	77
21	64	64	60
22	41	45	58
23	45	42	43

Planning Zone 93

Planning Zone 93 (PZ93) is 4.77 square miles and is home to Fire Station 3, the 750 acre Torrance Refinery, and the San Diego freeway (405 Freeway). In addition, PZ93 is home to several single-family residential neighborhoods, a significant number of high-density apartments, commercial properties, and car dealerships.

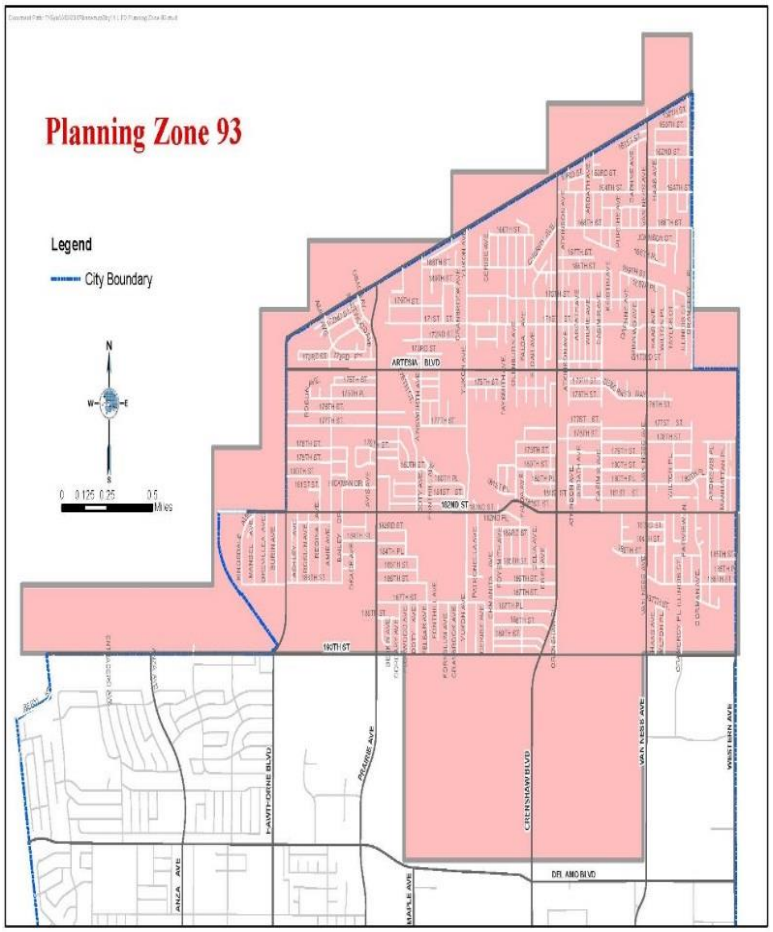


Figure 105: Planning Zone 93 Map

The majority of PZ93 is residential property. The zone has large multifamily residential apartments on Redondo Beach Blvd., Artesia Blvd., Yukon Ave., 182nd St., and Van Ness Ave. In addition, PZ93 is home to a large senior living complex on 186th St., west of Hawthorne Blvd. The area includes several mobile home parks which present unique challenges under fire conditions. The residential population in PZ93 is estimated to be 34,449. PZ93 is estimated to have 12,862 housing units with owners occupying 59.1% of the units. The median household income is $79,065 and the average income is $96,067.

The area south of 190th is occupied by the Torrance refinery and tank farm. The area on the north side of 190th street between Crenshaw Blvd. and Van Ness Ave. is a business park area that includes Honeywell Aerospace and several other manufacturing and commercial occupancies.

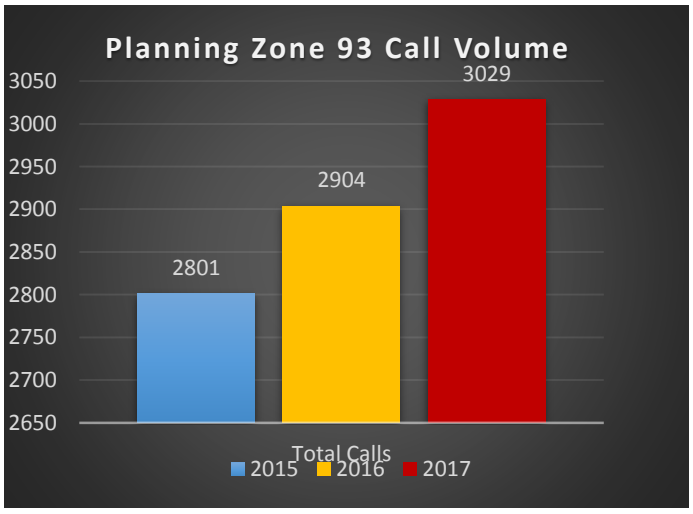
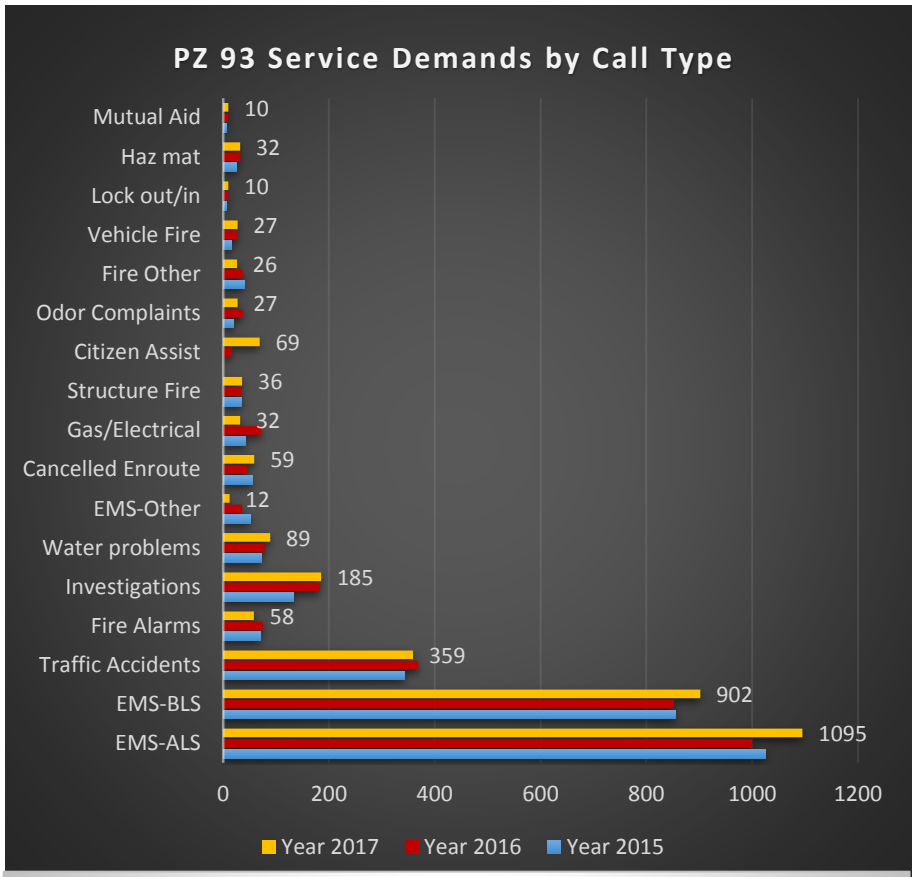


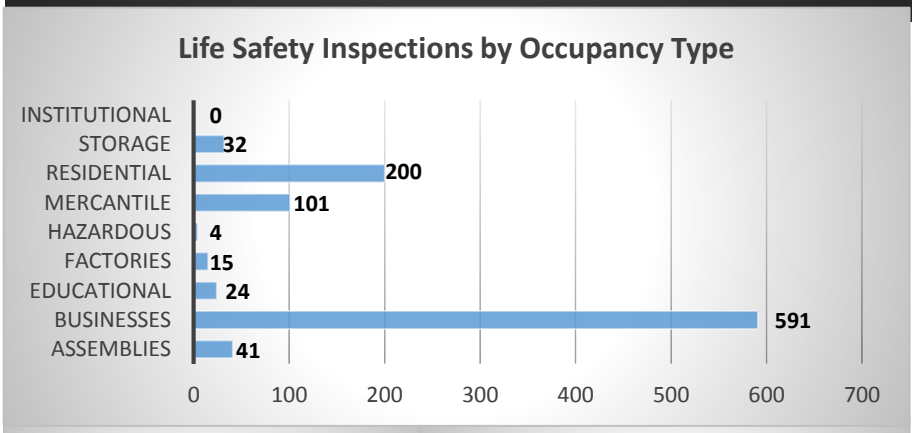
Figure 106: Planning Zone 93 Call Volume

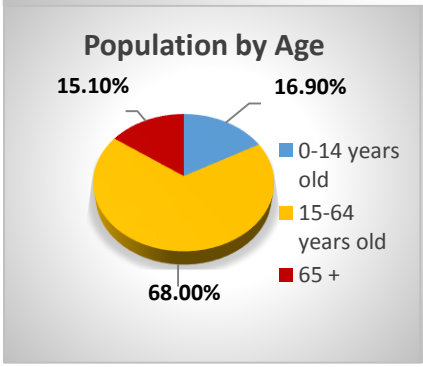
PZ93 has unique transportation hazards due to the San Diego Freeway and a portion of the BNSF railway. These transportation routes have hazardous cargo being transported through the city on a daily basis. In addition, PZ93 has several major streets including Western Ave, Crenshaw Blvd., Van Ness Ave, and Hawthorne Blvd.

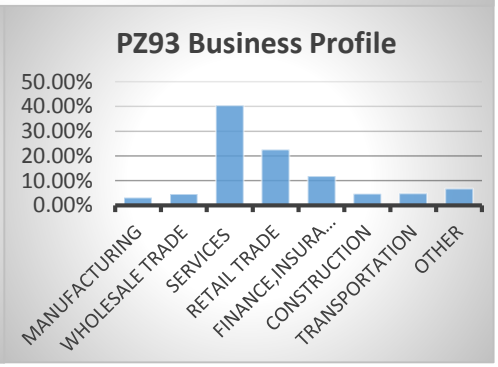
The following graphs show the business profile, service demands by call nature, number of life safety inspections TFD conducts by occupancy type, call volume by hour, and population age chart for PZ93.

Figure 107: PZ 93 Service Demands by Call Type, Call Volume by Hour, Life Safety Insp. by Occ. Type, Population and Bus. Profile









PZ 93 Call Volume by Hour

Hour	2015	2016	2017
0	67	71	93
1	58	53	69
2	51	58	69
3	56	69	50
4	47	63	66
5	66	60	61
6	66	88	77
7	117	120	110
8	139	127	144
9	152	172	154
10	153	144	161
11	157	170	190
12	162	170	194
13	178	181	187
14	157	146	172
15	156	187	153
16	152	169	168
17	152	147	157
18	138	147	156
19	155	148	137
20	127	109	134
21	117	124	126
22	93	109	104
23	85	72	97

Planning Zone 94

Planning Zone 94 (PZ94) is 2.35 square miles and is home to Fire Station 4, Torrance Beach, and the hillside residential neighborhood known as Hollywood Riviera. In addition, PZ94 is home to the Seaside Ranchos neighborhood, retail centers, and several large multifamily residential occupancies.

The area of PZ94 along Palos Verdes Blvd. and moving west towards the beach is largely comprised of apartment and condominium complexes.

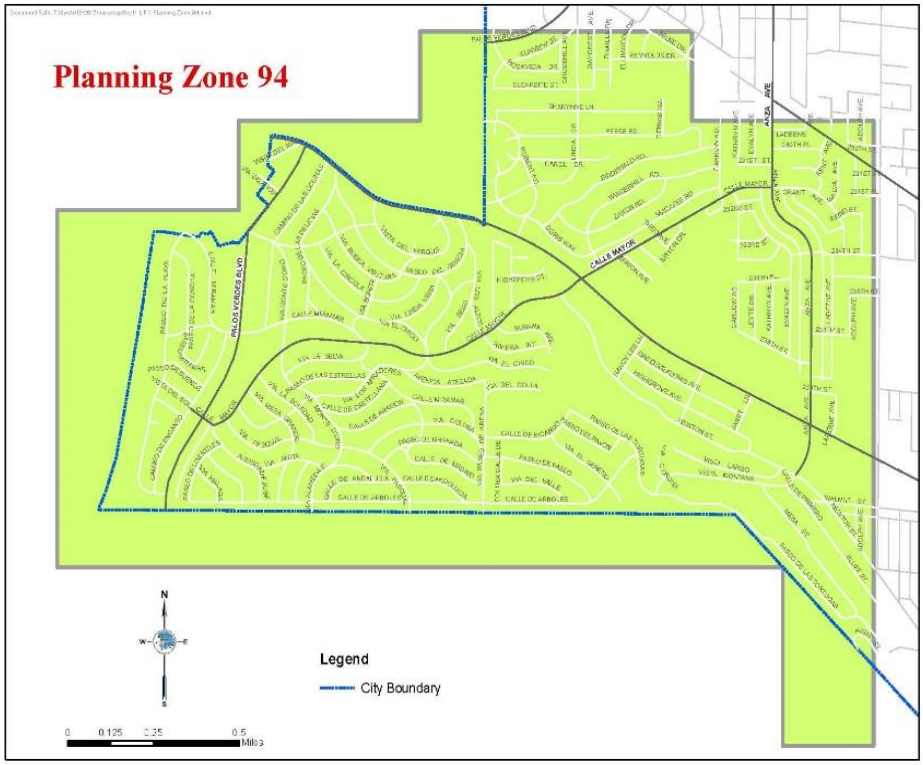


Figure 108: Planning Zone 94 Map

This includes the Cote De Azure complex which is home to a senior living community. The zone also includes several large apartment complexes along Pacific Coast Highway and Anza Ave. The residential population in PZ94 is estimated to be 20,555. PZ94 is estimated to have 8,438 housing units with owners occupying 57.4% of the units. The median household income is $101,033 and the average income is $133,947.

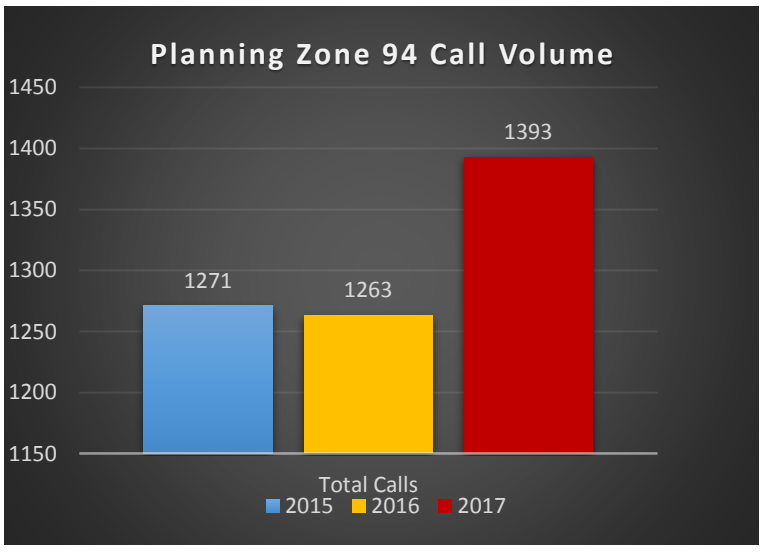


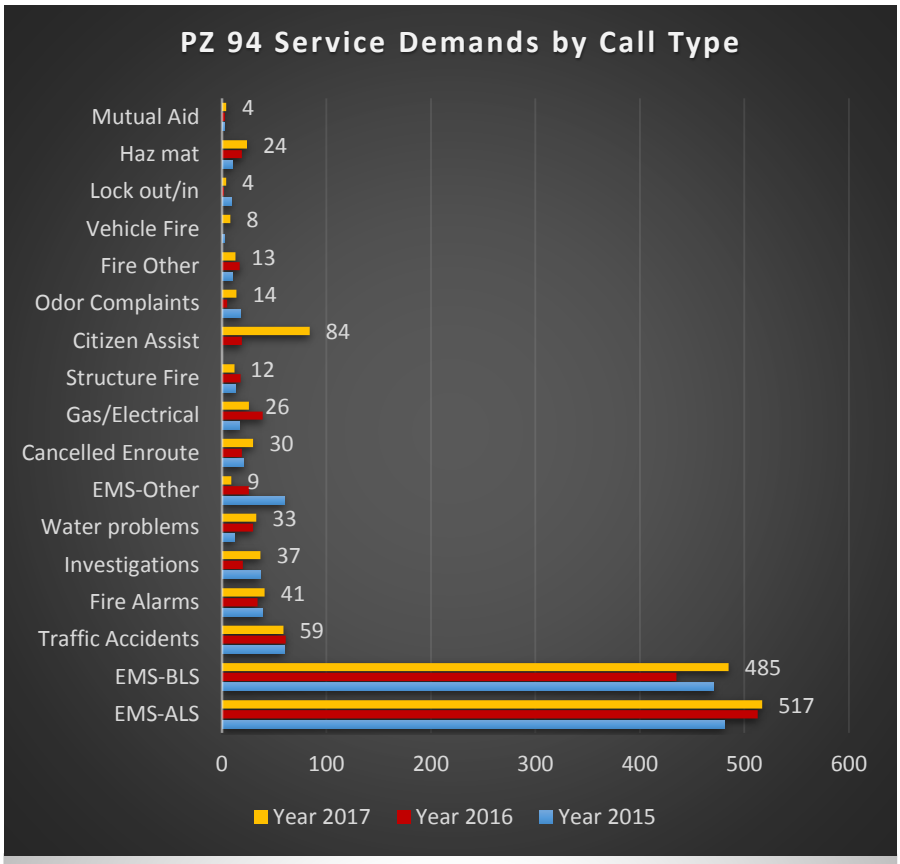
Figure 109: Planning Zone 94 Call Volume

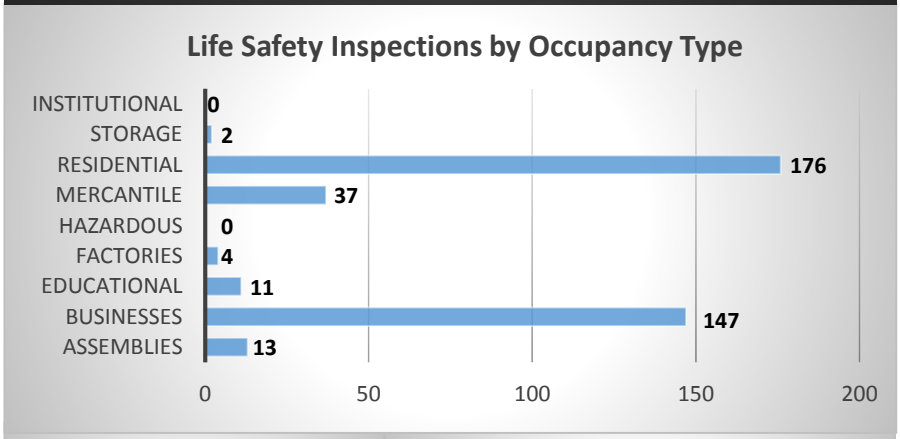
A majority of the businesses in PZ94 are located on Pacific Coast Highway, Anza Ave., and Palos Verdes Blvd.

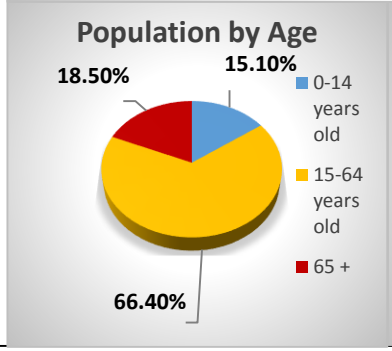
Significant hazards unique in PZ94 include large apartment and housing complexes, the hillside area that is prone to landslides, and the transportation corridor on Pacific Coast highway.

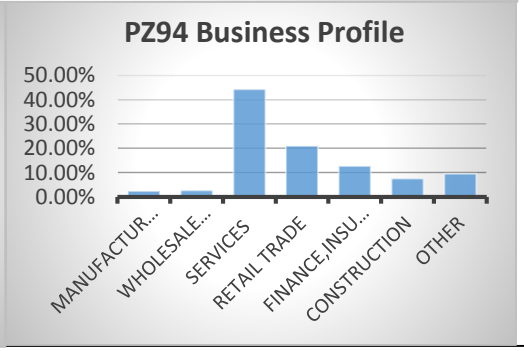
The following graphs show the business profile, service demands by call nature, number of life safety inspections TFD conducts by occupancy type, call volume by hour, and population age chart for PZ94.

Figure 110: PZ 94 Service Demands by Call Type, Call Volume by Hour, Life Safety Insp. by Occ. Type, Population and Bus. Profile









PZ 94 Call Volume by Hour

Hour	2015	2016	2017
0	38	27	33
1	31	28	39
2	28	31	26
3	26	32	34
4	22	17	26
5	23	23	17
6	29	29	36
7	49	48	51
8	54	55	59
9	70	76	91
10	77	71	87
11	65	63	86
12	72	68	92
13	78	64	81
14	74	86	84
15	81	62	77
16	74	79	76
17	77	80	61
18	51	69	77
19	52	61	57
20	62	54	58
21	57	66	51
22	41	43	53
23	40	31	41

Planning Zone 95

Planning Zone 95 (PZ95) is 2.96 square miles and is home to Fire Station 5, City of Torrance Maintenance Facility, Little Company of Mary Hospital, and several car dealerships along Hawthorne Blvd. In addition, PZ95 is home to several skilled nursing facilities, multiple senior residential living facilities, and a large retail center known as the Torrance Promenade.

PZ95 is mostly residential west of Hawthorne Blvd. above Del Amo Blvd. and west of Earl Street below Del Amo Blvd. There are several large apartment complexes on Anza Ave. between Torrance Blvd. and Del Amo Blvd. In addition, several large apartment complexes are located on Spencer St., Emerald St., Amie Ave., and Maricopa Ave. This includes Goldenwest Towers which is a sprinklered high rise that houses seniors that are mostly non-English speaking. The residential population in PZ95 is estimated to be 27,783. PZ95 is estimated to have 11,299 housing units with owners occupying 37.9% of the units. The median household income is $73,920 and the average income is $100,254.

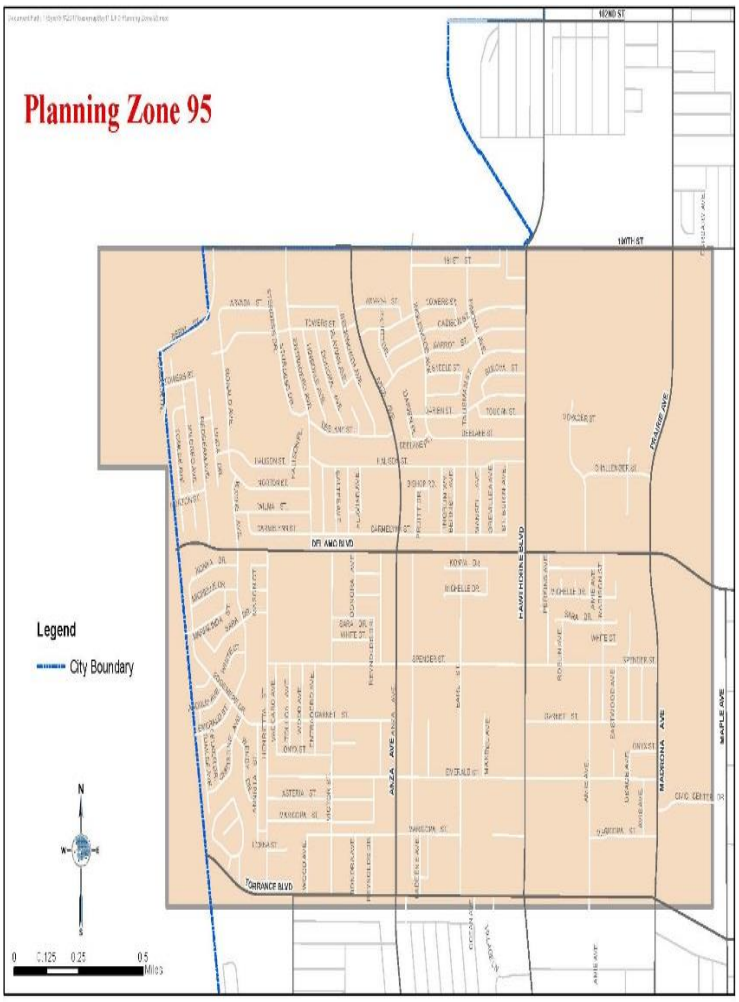


Figure 111: Planning Zone 95 Map

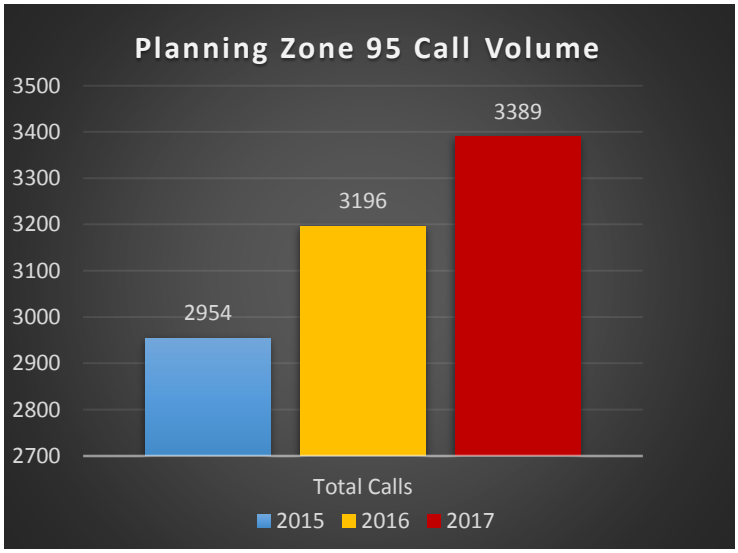
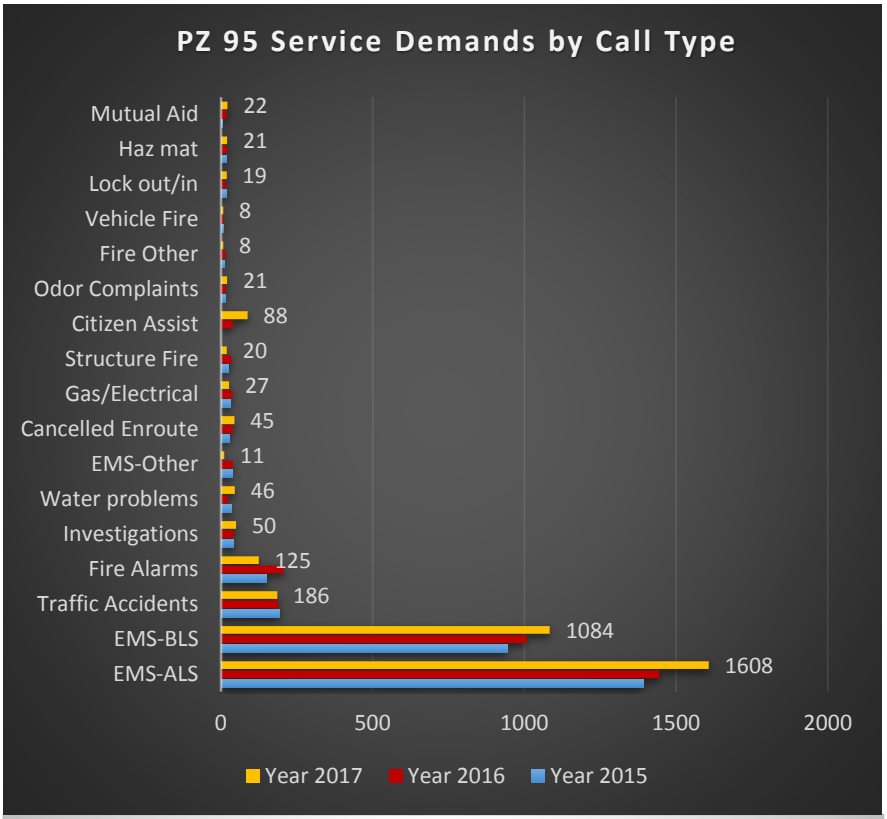


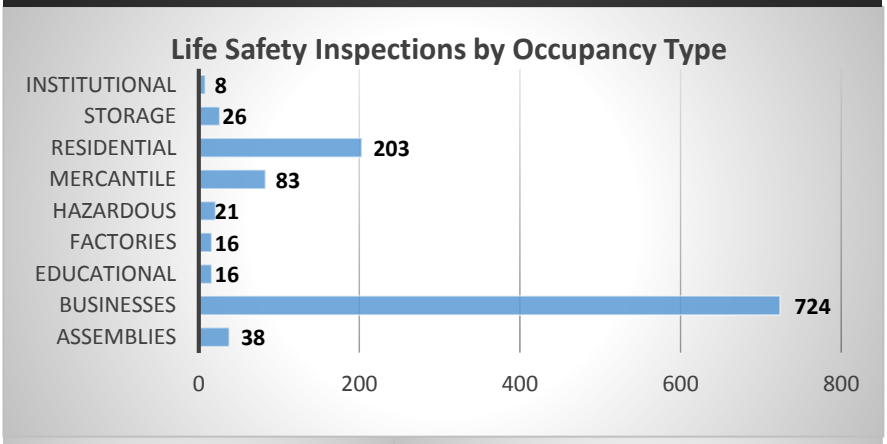
Figure 112: Planning Zone 95 Call Volume

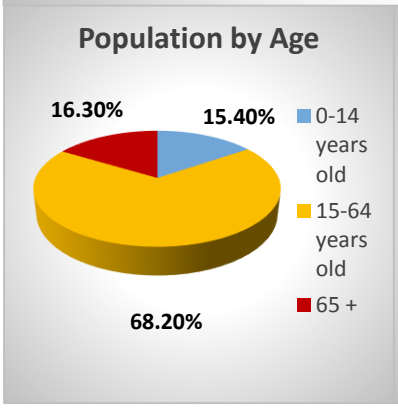
Significant hazards unique in PZ95 include large apartment and housing complexes, the industrial business in the northeast quadrant, Little Company of Mary Hospital, and a significant number of skilled nursing facilities.

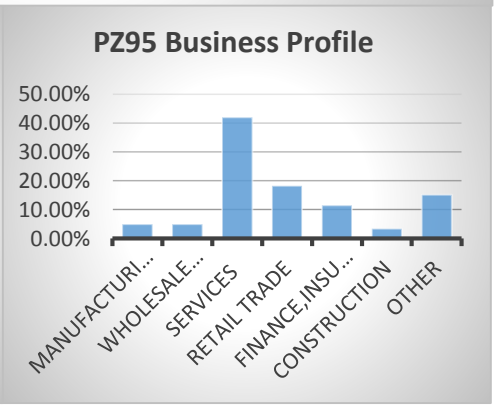
The following graphs show the business profile, service demands by call nature, number of life safety inspections TFD conducts by occupancy type, call volume by hour, and population age chart for PZ95.

Figure 113: PZ 95 Service Demands by Call Type, Call Volume by Hour, Life Safety Insp. by Occ. Type, Population and Bus. Profile









PZ95 Call Volume by Hour

Hour	2015	2016	2017
0	83	81	79
1	66	86	80
2	72	73	89
3	56	69	61
4	55	66	58
5	67	74	75
6	83	93	74
7	95	134	123
8	138	132	179
9	151	169	186
10	162	187	197
11	186	188	242
12	176	190	200
13	181	187	199
14	172	190	200
15	164	175	204
16	155	196	178
17	144	182	175
18	158	158	154
19	141	129	164
20	132	134	145
21	118	120	145
22	120	99	95
23	79	84	87

Planning Zone 96

Planning Zone 96 (PZ96) is 1.92 square miles and is home to Fire Station 6, Del Amo Fashion Center, Marriott Hotel, Doubletree Hotel, and Del Amo Crossings. In addition, PZ96 is home to many retail occupancies along Hawthorne, Torrance, and Sepulveda boulevards.

The western area of PZ96 is largely comprised of single family homes in the Southwood Neighborhood. There are also several large apartment and condominium complexes on Ocean Ave., Kent Ave., and 226th St. The residential population in PZ96 is estimated to be 14,616. PZ96 is estimated to have 5,133 housing units with owners occupying 64.7% of the units. The median household income is $93,400 and the average income is $116,241.

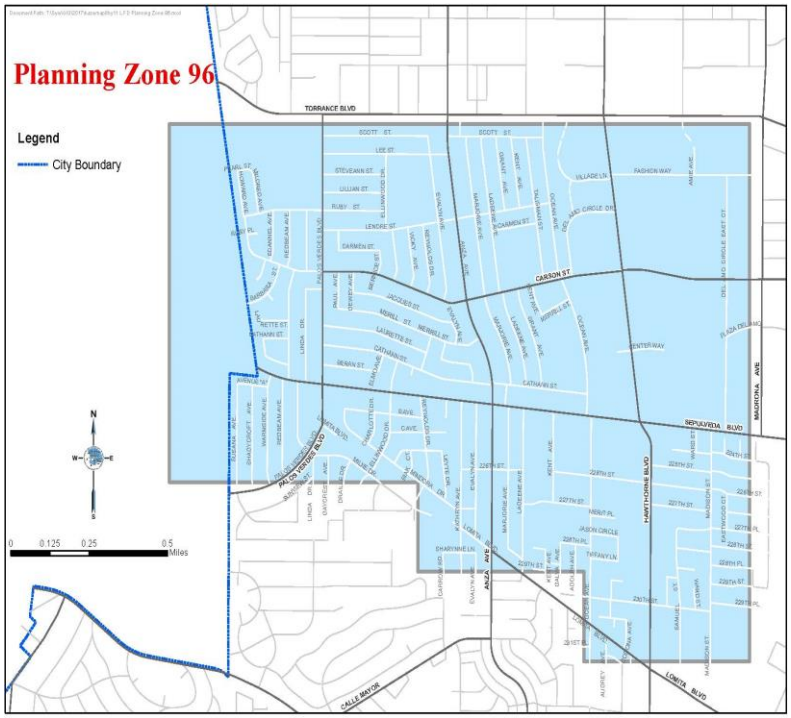


Figure 114: Planning Zone 96 Map

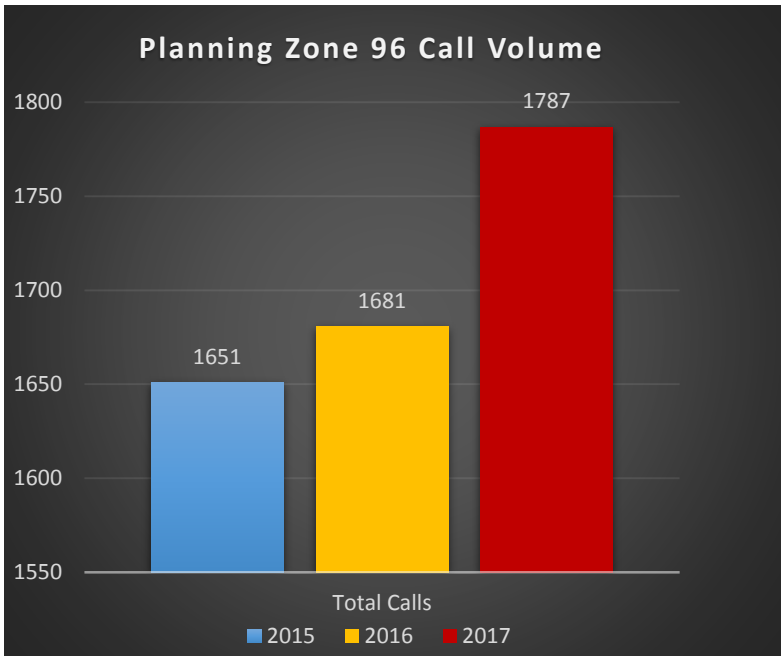


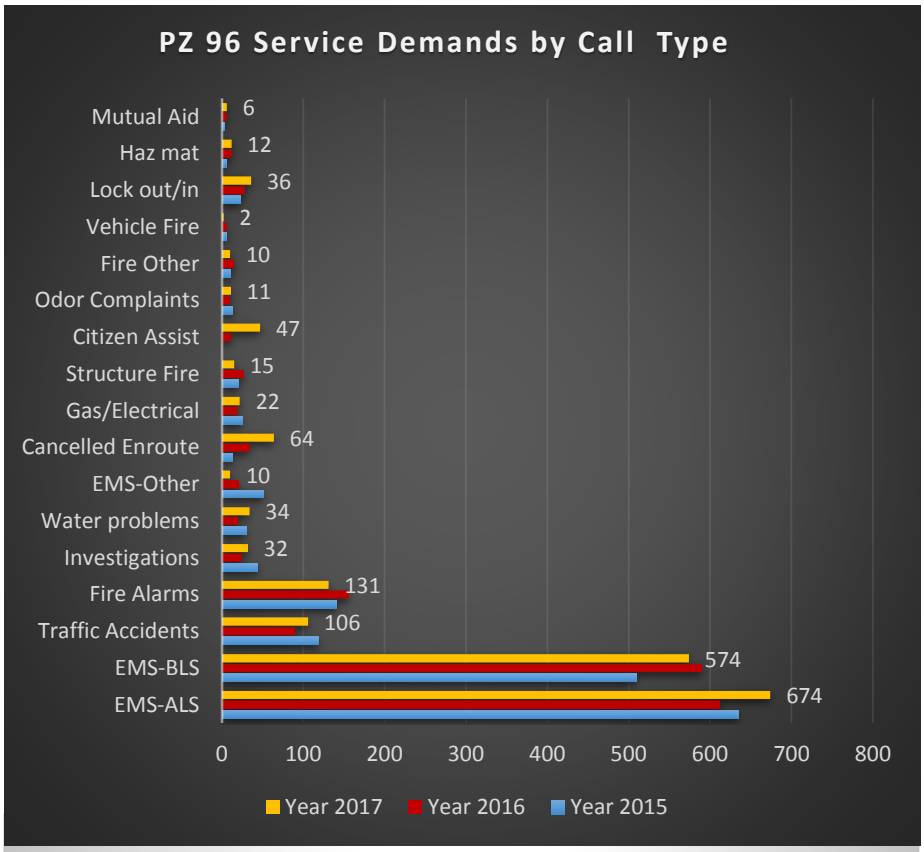
Figure 115: Planning Zone 96 Call Volume

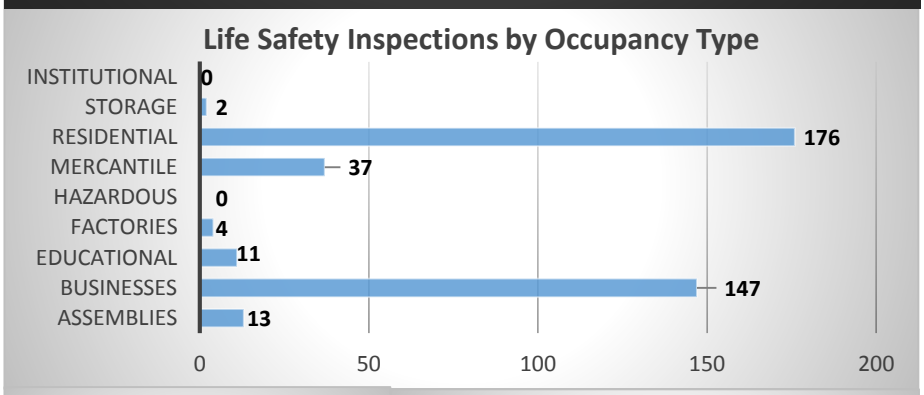
A majority of the businesses in PZ96 are located on Hawthorne Blvd., Carson St., and Sepulveda Blvd.

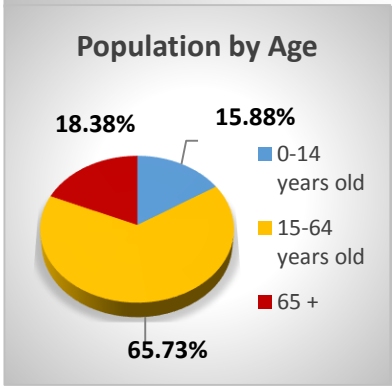
Significant hazards unique in PZ96 include large apartment complexes, high buildings, and the Del Amo Fashion Center which attracts shoppers and people looking for entertainment in large numbers.

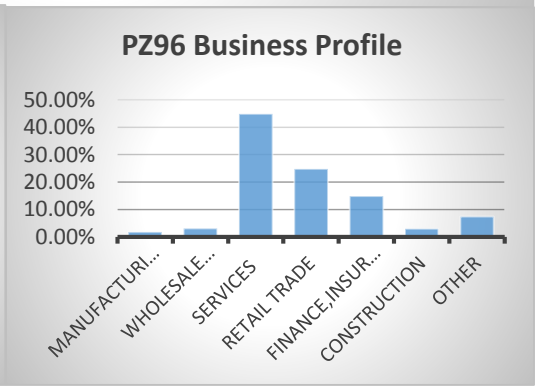
The following graphs show the business profile, service demands by call nature, number of life safety inspections TFD conducts by occupancy type, call volume by hour, and population age chart for PZ96.

Figure 116: PZ 96 Service Demands by Call Type, Call Volume by Hour, Life Safety Insp. by Occ. Type, Population and Bus. Profile









PZ 96 Call Volume by Hour

Hour	2015	2016	2017
0	46	42	43
1	32	24	34
2	28	34	41
3	35	25	19
4	20	29	17
5	31	28	28
6	30	33	35
7	58	55	48
8	65	55	71
9	71	74	94
10	102	93	107
11	89	109	123
12	114	122	124
13	105	119	140
14	82	105	109
15	94	91	107
16	117	109	101
17	87	84	86
18	104	100	94
19	75	82	100
20	83	88	96
21	68	70	63
22	59	60	60
23	56	50	47

Planning Zone 97

Planning Zone 97 (PZ97) is 3.03 square miles and is home to several large residential neighborhoods, Wilson Park, and the Madrona Marsh. The bulk of the properties in PZ97 are residential. The residential population in PZ97 is estimated to be 30,440, making it the most populated planning zone. PZ97 is estimated to have 11,926 housing units with owners occupying 60.6% of the units. The median household income is $86,867 and the average income is $107,091.

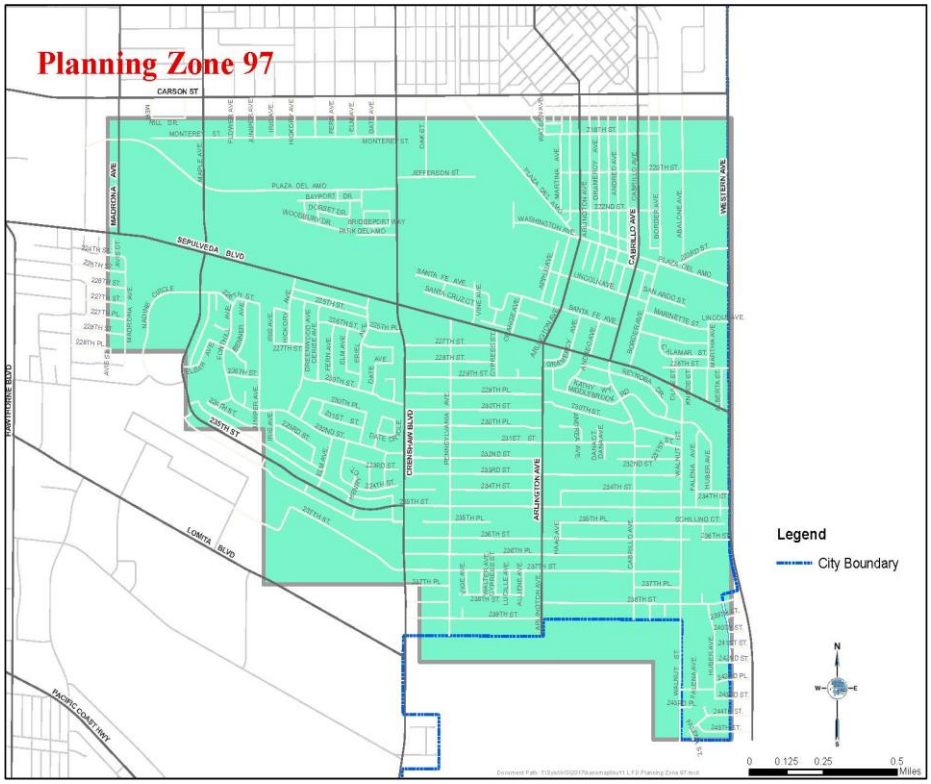
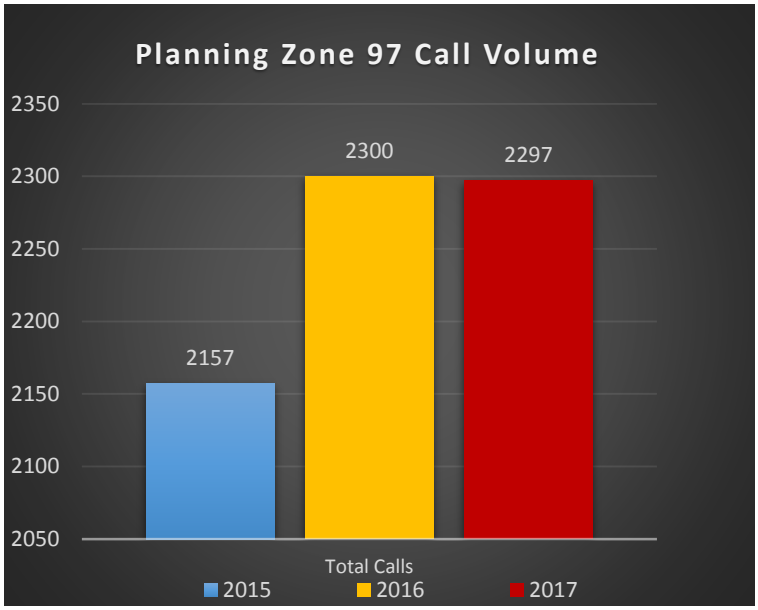


Figure 117: Planning Zone 97 Map

Figure 118: Planning Zone 97 Call Volume



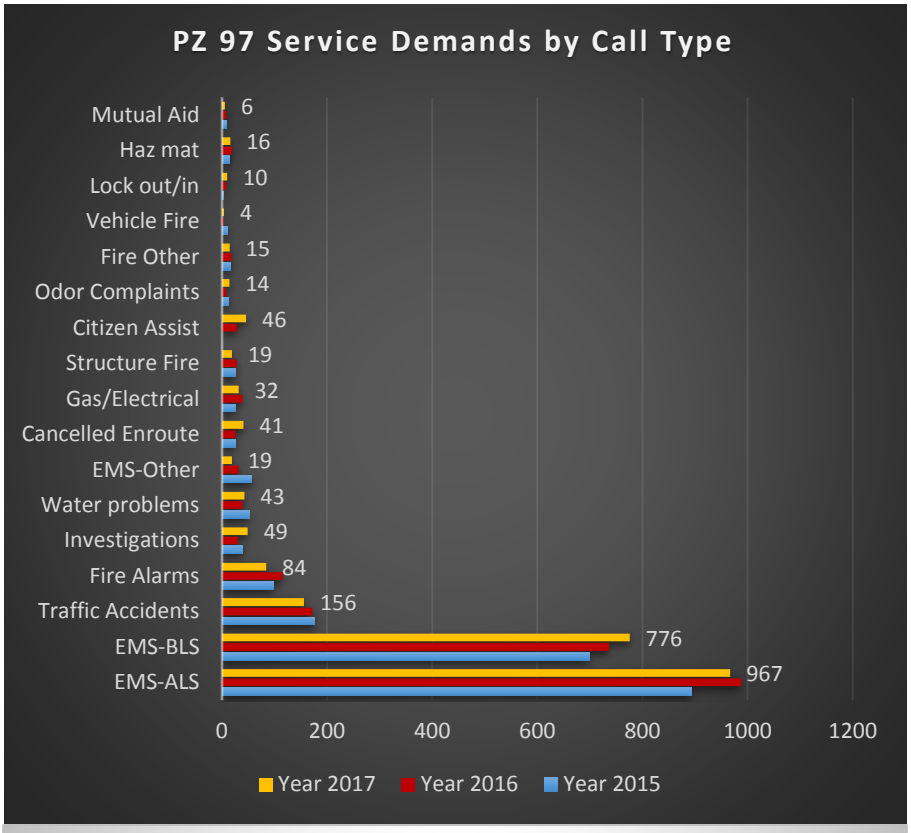
The area along Crenshaw Blvd. and Sepulveda Blvd. make up a large portion of the business occupancies, most of which are retailers or commercial offices. The exception are some of the businesses on Western Ave. and the commercial and manufacturing businesses west of Crenshaw Blvd. at 237th St.

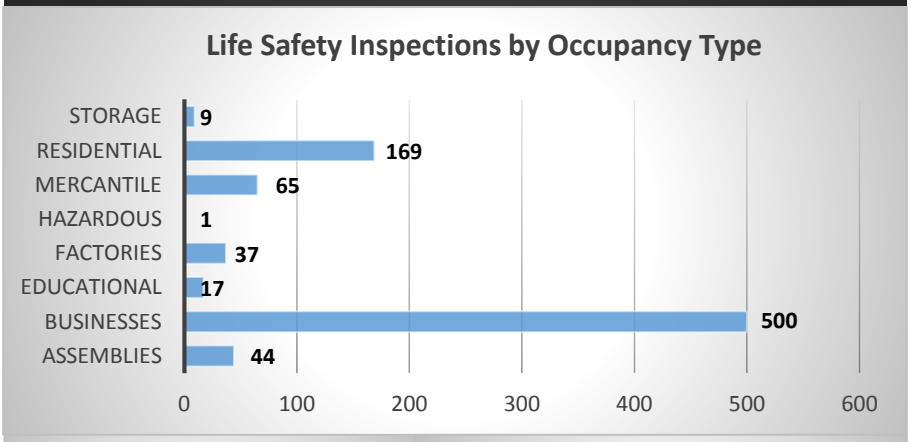
There are several high density gated communities between Crenshaw Blvd. and Madrona Ave. on Plaza del Amo. In addition, Nadine Circle houses a large senior community, known as New Horizons. There are several very large apartment complexes scattered throughout the zone.

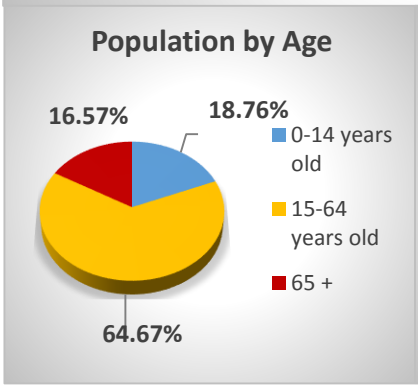
Significant hazards unique in PZ97 include the access issues at gated communities, the pipelines that run underneath Crenshaw Blvd. and from the tank farm at Crenshaw Blvd. and Lomita Blvd.

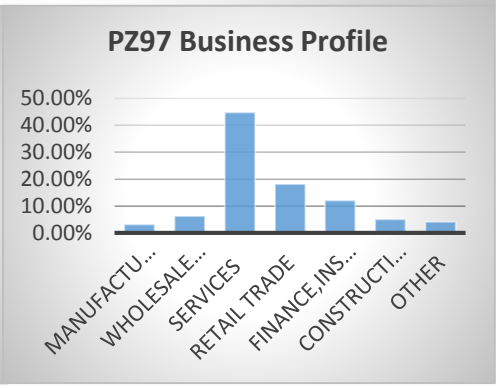
The following graphs show the business profile, service demands by call nature, number of life safety inspections TFD conducts by occupancy type, call volume by hour, and population age chart for PZ97.

Figure 119: PZ 97 Service Demands by Call Type, Call Volume by Hour, Life Safety Insp. by Occ. Type, Population and Bus. Profile









PZ 97 Call Volume by Hour

Hour	2015	2016	2017
0	51	53	46
1	57	41	36
2	53	39	39
3	29	36	36
4	41	29	43
5	34	42	42
6	59	70	60
7	84	87	85
8	115	130	108
9	128	147	140
10	131	132	153
11	133	153	164
12	136	124	126
13	126	161	131
14	124	138	131
15	99	121	137
16	109	149	119
17	117	119	141
18	109	110	112
19	97	111	122
20	104	93	92
21	88	91	99
22	78	65	60
23	55	59	75

Section 5 – Deployment and Coverage Strategies

Deployment Time/Effective Response Force Considerations

The elements of time and number of responders are critical considerations when evaluating deployment and coverage strategies. Simply stated, TFD deployment and coverage strategies are about the speed and the effectiveness of the response force required to initiate a proper attack or intervention. Speed requires first-due apparatus (engines, trucks, rescues) to be strategically distributed throughout the response area to produce travel times that provide positive outcomes. Placing apparatus strategically allows the first due units to keep incidents from escalating in size, scope, and complexity. A quick response keeps minor or moderate emergencies from needing additional resources, which maintains the proper distribution and concentration of resources within the rest of the community.

An effective response force (ERF) is the minimum amount of equipment and staffing that must reach the scene of emergency to initiate an effective intervention strategy. The ERF consists of enough firefighters assembled on scene to safely control the emergency and keep it from escalating to a greater alarm incident. The community expects the TFD to be able to quickly and safely handle the typical emergency medical incident or a typical fire. Considering the TFD cannot arrive instantly to save every person or hold every fire to the room of origin, the department's response objective must always consider the effectiveness, efficiency, and reliability of the ERF to keep the community risk level reasonable. At the same, the department always considers the safety of the responders. This distribution and concentration of resources strategy is illustrated in the below table:

	Meaning	Purpose
Speed of Response "Distribution"	Total response time of first-due units strategically located across the community.	Control emergencies without the incident escalating in size, scope, and complexity.
Effectiveness of Force "Concentration"	Proper number of firefighters sent to the incident to effectively mitigate the incident	Assembling enough qualified personnel within a reasonable time frame to safely control the emergency.

Figure 120: Distribution and Concentration of Resources Strategy

The deployment strategy is to distribute well-trained, properly equipped personnel across the community for quick response to improve emergency outcomes, without spreading the crews so far apart that they cannot arrive in the proper concentration to be effective in major emergencies. Low and moderate risk fires and medical emergencies typically require only one or two resources with a quick response time to keep the incident from escalating; therefore, TFD sends only one or two resources leaving other units available for other potential incidents. This philosophy increases the systems reliability and resiliency to respond other emergencies at the same time. Larger incidents require more resources and typically cause coverage issues in the rest of the community until units return to service. In either case, if the crews arrive too late or with too little trained personnel, they are drawn into a losing and more dangerous battle.

Typically, the longer it takes for TFD personnel to arrive on the emergency scene, the worse the outcome of the event. For that reason, the TFD considers the importance of time and its connection to better incident outcomes. The TFD considers four significant time-based factors:

- Cascade of Events
- Fire Behavior
- Chain of Survival
- Golden Hour

Cascade of Events

The Cascade of Events is a predictable sequence of events resulting from an act or event impacting the response system. The Cascade of Events starts from a state of normalcy and returns to a state of normalcy. By understanding the cascade, it is possible for the TFD to assess and predict future effects and their subsequent demands of the response system. When evaluating the Cascade of Events, the terms soft data and hard data are used. Soft data is full of human opinions, suggestions, interpretations, contradictions, and uncertainties. Hard data describes data generated from the digital records management system that can be measured, traced, validated, graphed, and reported with accuracy.

While TFD does not monitor soft data, the department does provide public education to improve the community's performance on soft data items such as the initiation of 911, early intervention hands only CPR instruction, and fire extinguisher training for use during incipient phase fires. Currently, TFD uses soft data for measuring the initiation of action after arrival on scene; however, with the implementation of electronic patient care reports this data may become hard data in the next year. Soft data may occur in the short term (seconds/minutes) or long term (hours /days). For example, over the past week a person had recurring issues with a faint burning odor; however, a request for a fire department response may not reached until the homeowner finally notices light smoke inside the home.

The **alarm handling time** is measured from the time the call is initiated at the Public Safety Answering Point (PSAP), which is located at the Torrance Police Station, until the call is assigned in the dispatch system and sent to the responding apparatus. TFD operations personnel have very little impact on alarm handling times; with the exception of ensuring their response status is correct within the CAD.

The turnout and travel times are times that TFD operations personnel can directly impact through their performance. **Turnout time** measured from the time the unit is notified, gets to their apparatus, get dressed properly for the call type, and gets the wheels rolling out the door. Efficient turnout times ensure operations personnel respond safely with a sense of urgency. **Travel time** is measured from the time the unit is en route until they arrive on scene. Travel time can be altered slightly by a driver that uses good driving techniques and follows the proper route. Traveling safely at an effective speed should be the highest priority of the crew, not the rate of traveling speed. Travel times have been reduced through the use of the opticom light changing system. **Total Response Time** is measured from the alarm answering time until the apparatus arrives on scene and initiates action.

TFD can monitor and report hard data using the computer aided dispatch and records management system (RMS) for alarm handling time, turnout time, travel time, total response time, and total time units

are assigned to incidents. For the most accurate reflection of performance, the RMS data is used to provide reporting instruments. Benchmarks for measuring are contained in the National Fire Protection Association's Standard 1710 which meet the community's expectation for a quick response. This information is reported in the performance section of the standards of cover. The following table describes the Cascade of Events.

State of Normalcy	
Event Initiation-911 phone call	The point in which a condition occurs requiring an emergency response (soft data)
Alarm Transmitted to PSAP	Point at which the call taker at the communications center is alerted (soft data)
Alarm Answering Time at Public Safety Dispatch Center	Alarm is answered and transferred to Fire Dispatcher
Alarm Processing Time Performance Indicator: 90% in 64 Seconds	Alarm is answered by fire dispatcher, units are assigned, and the call is transmitted to the responding units
Turnout Time EMS Performance Indicator: 90% in 60 seconds Fire/Special Operations Performance Indicator: 90% in 80 Seconds	Measured from the time the call is sent to the responding unit until the unit is responding
Travel Time **First Unit on Scene** Performance Indicator: 90% in 4 minutes **Effective Response Force** Performance Indicator: 90% in 8 minutes	The time interval begins when the responding unit is en route to the emergency scene and ends when the unit arrives on scene. Arrival of all required resources
Initiate Action or Intervention Time	The point at which the responding units begin operations to mitigate the event. May include size-up, patient contact, resource deployment, etc. (soft data)
De-escalation Phase	The point at which the units have completed interventions and begin to return their tools, equipment, and personnel back to state of readiness. (soft data)
Termination of Event	The point at which units return to service and are available for another response
State of Normalcy	

Figure 121 :Cascade of Event, National Fire Protection Association's Standard 1710

Time and Fire Behavior

The modern fire environment inside residential properties has changed dramatically. A scientific report from Underwriters Laboratories (UL) states that while the physics of fire development has not changed over time, the fire environment inside homes has evolved. Several factors including home size, geometry, flammability of contents, and construction materials have changed significantly. These factors result in faster fire growth, shorter time to flash over, rapid changes in fire dynamics, shorter escape times, and shorter time to structural collapse. Ultimately, these factors directly affect the safety and well-being of both citizens and firefighters. Given the science, it is critical that TFD continue to strive to limit total response times to structure fires by distributing fire engines, trucks, and rescues strategically to reduce travel time; and therefore extinguish fires in the early stages.

Figure 122: Modern Fire Environment, Source: US Dept. of Commerce's NIST

A landmark study conducted by the U.S. Department of Commerce's National Institute of Standards and Technology (NIST) in 2010 showed that the size of firefighting crews has a substantial effect on the fire service's ability to protect lives and property in residential fires. The study was performed by a broad coalition in the scientific, firefighting, and safety communities and found that four-person firefighting crews were able to complete 22 essential firefighting and rescue tasks in a typical residential structure 30 percent faster than two-person crews and 25 percent faster than three-person crews. TFD Engine Company staffing is currently 4 personnel at all times. Maintaining the staffing level is a priority that will be challenged with the increased call volume, traffic congestion, and budget constraints. In addition to being more effective from a tactical standpoint, maintaining 4 person staffing allows crews to conduct interior firefighting operations in accordance with the OSHA 2-in, 2-out policy resulting in increased firefighter safety.

Chain of Survival

The American Heart Association's chain of survival is a metaphor for the elements of the emergency cardiovascular care systems concept. The below graphic from the American Heart Association's website illustrates the chain of survival:

Figure 123: Chain of Survival. Source: American Heart Association

Much like the need to respond to fire quickly, the total response time to cardiac emergencies plays a critical role in patient outcome. Circulating blood that contains oxygen is required to keep tissues in the body alive and functioning. The brain may sustain damage after blood flow has been stopped for about 4 minutes. There is irreversible damage to the brain after blood flow has stopped for 7 minutes. To be successful, CPR should be started within 6 minutes of a person having a sudden cardiac arrest. Early recognition and activation of the emergency response system is a focus of the TFD public education program. Additionally, early and effective CPR and defibrillation increases patient survivability, even when performed by a lay rescuer. The arrival of trained EMT's and paramedics is a critical component to positive outcomes and was the foundation of the early paramedic program in Los Angeles County. Finally, transferring care to doctors at our world-class hospitals is the final link in the chain.

According to the American Heart Association, more than 350,000 people in the United States suffer from out-of-hospital cardiac arrest each year and just 12 percent survive. However, statistics show that if more people knew CPR, more lives could be saved. Immediate CPR can double, or even triple, a victim's chance of survival.

In addition to early CPR, early intervention into other cardiac related events can have a positive outcome. While many use the terms heart attack and cardiac arrest interchangeably, they are significantly different events. Cardiac arrest occurs when the heart malfunctions and stops beating unexpectedly. Cardiac arrest is triggered by an electrical malfunction in the heart that causes an irregular heartbeat (arrhythmia). With its

pumping action disrupted, the heart cannot pump blood to the brain, lungs and other organs resulting in tissue death and irreversible effects.

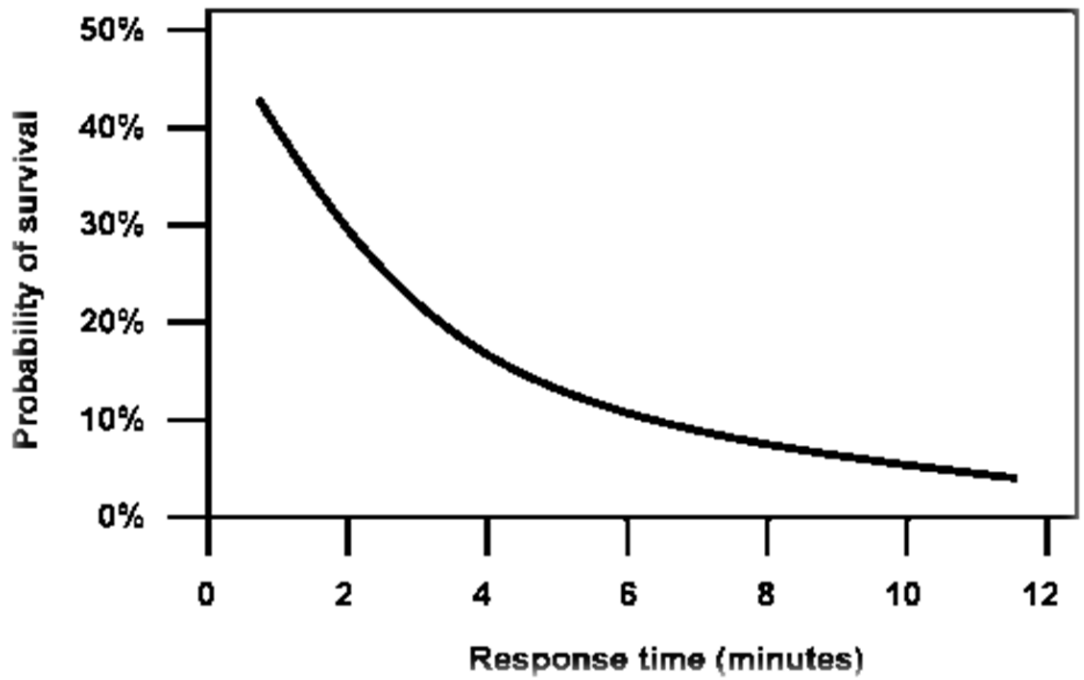


Figure 124: CPR Statistics. Source: JAMA/American Medical Heart Association

A heart attack occurs when blood flow to the heart is insufficient resulting in damage. Generally speaking, a heart attack is a circulation problem, not an electrical issue. When oxygen rich blood is prevented from reaching cardiac tissue for a period of time, the part of the cardiac tissue that is normally nourished by the artery begins to die. Unlike with cardiac arrest, the heart usually does not stop beating during a heart attack. The longer the person goes without treatment, the greater the damage; thus the need to respond quickly with highly trained professionals to intervene with proven therapies for better patient outcomes. For these reasons, TFD believes that every second counts!

Golden Hour

Time is also a factor for patients that meet trauma center criteria. For the best patient outcomes, patients must be in surgery within 1 hour from the time of the trauma occurring. This is known as "the golden hour". For this reason, most trauma patients do not remain on the emergency scene and receive extensive treatments. Most patient treatment is provided while en route to the trauma center.

TFD Cardiac Arrest Data

The following chart demonstrates the outcome of TFD efforts in increasing CPR capabilities within the community. Since 2014, TFD has seen a direct correlation between bystander CPR and improved patient outcomes. In 2014 only 6% of all cardiac arrests in Torrance had bystander CPR in progress when TFD arrived on scene resulting in a relatively low ROSC score of 14%. In 2017, 36% of all cardiac arrests in Torrance had

bystander CPR in progress and the ROSC score improved to 26%. This is a significant increase in patient outcomes and justification for continuing public outreach and education related to CPR.

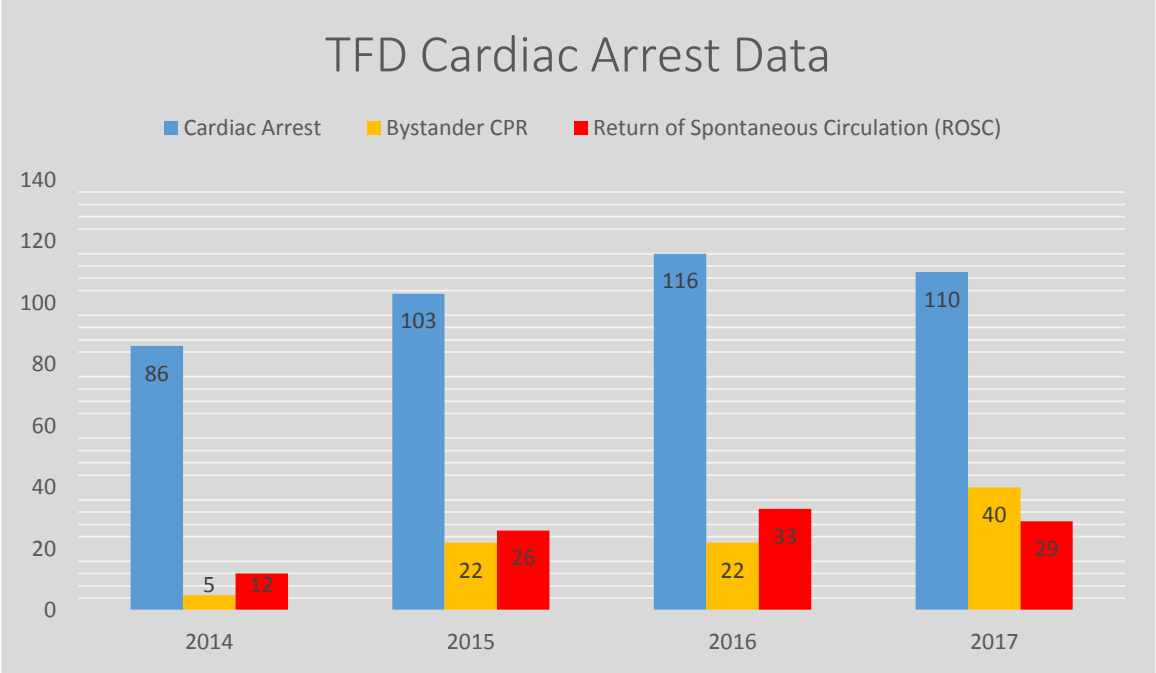


Figure 125: TFD Cardiac Arrest Data 2017

TFD Documented AED Usage

The table below shows the number of times an automated external defibrillator (AED) was used and documented on non-traumatic cardiac arrest patients in calendar year 2017.

AED Use - 2017	
Non-traumatic CA 2017	*100*
Community AED Use	*7 – 7%*
TPD AED Use	*1 – 1%*
TFD AED Use	*2 – 2%*

Figure 126: TFD AED Usage 2017

TFD Response Plan Strategy

The TFD employs a response plan strategy that is focused on sending the appropriate number and type of apparatus in a timely manner that allows highly trained and motivated firefighters to do their job in a safe and effective manner. While each emergency is unique and presents its own challenges, properly trained and equipped personnel are capable of forecasting and calling for additional resources when they are needed. Generally, the higher the risk or more complex the operation, the more resources will be needed. For example, more resources are required to effectively control a fire inside a building when a confirmed rescue problem is presented. On the flipside, fewer resources would be required for a vehicle fire that is not impinging upon a structure. Creating the appropriate level of response requires making decisions regarding the distribution and concentration of resources in relation to the potential demand of the incident, as well as being available for the next incident. As mentioned in the fire risk assessment section, TFD does not base the response plan on the occupancy risk level, rather the response plan is based on providing a first alarm assignment that is capable of providing an effective response force capable of performing critical tasks. The Incident Commander is the best equipped to make a decision on additional resources that may be needed to safely mitigate the incident.

In addition to emergency requests for service, the TFD does respond to a variety of low risk requests for service such as citizen complaints, unusual odors, nuisance alarms, non-emergency police assist, etc. While these incidents do not require units to respond with the same sense of urgency as an emergency, the TFD does have a target of arriving in less than 15-minute travel time to maintain reliability of the system. While en route to these incidents, company officers are encouraged to monitor the radio traffic for emergency incidents in their area. If the company officer hears a higher priority call in their area, they are empowered to make themselves available for the emergency call. Empowering company officers to make decisions within their jurisdiction provides the highest level of service to the community. In these cases, the lower priority call will be handled by the next due unit.

Apparatus Staffing

The TFD's operations personnel work a 56-hour schedule and staff 14 "front line" apparatus and one platoon commander unit. The operations personnel work the 48/96, 3-platoon shift schedule. TFD personnel staff 7 engines, 2 tiller operated trucks, 5 paramedic rescues, and a platoon commander vehicle 24 hours a day, 365 days a year. Daily operations staffing is 46 personnel at all times.

All of these apparatus and units are named using standardized resource identification and numbering system consistent with California Mutual Aid, Region 1, Area G criteria. All TFD apparatus numbers begin with the number "9" to represent Torrance within Area G, followed by the station number they are assigned to. For example, E91 is a Torrance engine from station 1. The one unique numeric indicator is E97 which is the second engine assigned at Fire Station 1. The TFD's frontline apparatus and unit resources, including minimum staffing is listed in the following table:

Apparatus	Staffing
Engine 91	4 Person
Engine 92	4 Person
Engine 93	4 Person
Engine 94	4 Person
Engine 95	4 Person
Engine 96	4 Person
Engine 97	4 Person
Truck 91	4 Person
Truck 96	3 Person
Rescue 91	2 Person
Rescue 93	2 Person
Rescue 94	2 Person
Rescue 95	2 Person
Rescue 96	2 Person
B91	1 Person
Total	46 Personnel

Figure 127: TFD Apparatus and Staffing

The TFD also has numerous unstaffed and reserve units including a technical rescue vehicle, a hazardous materials response vehicle, 2 foam units, and utility vehicles. These units are crossed staffed with engine or truck personnel from the station they are housed resulting in less firefighting forces while they are in service.

Critical Tasking

Critical tasking defines what must be accomplished for positive outcomes at incidents. In developing critical tasks, TFD considered the size, scope, and, complexity of the event. Additionally, TFD considered the response capabilities of personnel and equipment. The determination and summation of critical tasks is the foundation of an Effective Response Force for each response classification (e.g., fire, rescue). Critical Tasking provides answers to the "what and why" questions regarding the number of personnel and type of apparatus sent to an emergency scene. The justification for each of the tasks can be found in standard operating guidelines (SOG's) related to the particular call nature. SOG's are based on a combination of industry standards, laws and regulations, community expectations, available resources, and the training level of the responders. All critical tasks are consistent with the following goals and objectives:

Strategic Goals at all fires are (1) Life Safety, (2) Incident Stabilization, (3) Property Conservation, and (4) Safety, Accountability, and Welfare of all personnel working at the incident. Strategic goals will be met through the use of tactical objectives, support objectives and task assignments.

Tactical Objectives for TFD structure fires are REVAS: Rescue, Exposures, Ventilation, Attack, & Salvage. The incident will dictate the order of tactical objective assignments.

Support Objectives are secondary objectives at an emergency that are implemented based on the size, scope, and complexity of the fire. Support objectives include fire investigation, ambulance on scene,

agency notification, city coverage for other incidents, Public Information Officer, police support, crew rotation and rehabilitation, and public notifications

Situational Awareness is maintained by constantly evaluating the fire environment. All TFD personnel are trained to use a problem solving technique to increase situational awareness and make sound decisions. FADE is the acronym (Facts, Alternatives, Decisions, Evaluate) used for problem solving as incident information becomes available to firefighting personnel. As facts come in, they are addressed with multiple alternatives. A decision is made on what alternative to implement. The decision is implemented and evaluated for effectiveness. FADE always includes a risk/benefit analysis.

The following pages outline "critical tasking" for Structure Fire 1st alarm, Structure Fire 2nd Alarm, Low /Moderate Risk Fire, EMS-ALS, EMS-BLS, Hazardous Materials Level 1, Hazardous Materials Level 2, Hazardous Materials Level 3, Technical Rescues (Confined Space, Trench Rescue, Hillside Rescue), Traffic Accidents, Traffic Accidents with Entrapment, Train Derailment and Aircraft Emergencies. As with all emergencies, these tasks are guidelines and may be changed by the Incident Commander.

(HIGH RISK) 1st Alarm Structure Fire		
Apparatus	Tasks	Personnel
First Engine	• Establish command. • Complete 360 size-up • Establish water supply and pump operations • Initiate fire attack on floor involved. • On arrival of A/C, assume appropriate division or reunite with company.	4
Second Engine	• Back Up Fire Attack • Exposure Protection • Forcible Entry	4
First Truck	• Ladders • Ventilation • Utilities	3
First Rescue	• Search and Rescue	2
Platoon Commander	• Incident Command/Safety	1
Second Rescue	• Medical Group	2
Total Personnel		16

Figure 128: TFD Critical Tasking for 1st Alarm Structure Fire

Incident Command-The Incident Commander is the person responsible for all aspects of an emergency response; including quickly developing incident objectives, managing all incident operations, assigning resources based on the risk management plan of the incident action plan, as well as the safety of all emergency personnel.

Fire Attack- An effective fire attack requires a pump operator to deliver effective fire streams using the apparatus mounted pump. A minimum of two firefighters is required to deploy a 1 ¾" hose line capable of delivering 150 gpm or a 2 ½" hose line capable of delivering 250 gpm or more for fire attack.

Back-up Fire Attack- A minimum of two firefighters with a 1 ¾" hose line is deployed to back up the initial fire attack company with an additional 150gpm of water. The added line will help extinguish the fire and provide protection for the initial fire attack crew in the event of a burst hose or loss of water.

Ventilation- TFD is an aggressive vertical ventilation department when the incident risk profile justifies the action. Ventilation is the process of allowing heat and smoke to travel upwards and out of a structure. This is performed by cutting vents or making use of existing openings in the roof of the structure. Accomplishing vertical ventilation effectively requires a large number of resources.

Search and Rescue- A search and rescue crew is assigned to complete a rapid and systematic search of the fire area intended to find and remove viable victims to an area of safety.

Medical Group-A medical group is assigned to triage, treat, and transport the sick and injured from the fire scene to advanced medical care at the hospital.

Two in/Two out rule- This safety rule applies if the fire has extended beyond the incipient stage and no rescue problem exists. The rule states that the fire attack crew must consist of two personnel; additionally, two personnel must be outside the fire environment for safety.

Rapid Intervention Crews (RIC)- The RIC serves as a stand-by rescue team for personnel and is available for the immediate search and rescue of any missing, trapped, injured or unaccounted personnel. Typically, this assignment is not given to a first alarm unit.

First Alarm Philosophy- The first alarm assignment is designed to get an effective response force en route to the initial fire report. If a structure fire is confirmed or the dispatch center is receiving multiple calls indicating a structure fire, then the alarm should be upgraded to a 2nd alarm.

(HIGH RISK) 2nd Alarm Structure Fire		
Apparatus	Tasks	Personnel
First Engine	• Establish command. • Complete 360 size-up • Establish water supply and pump operations • Initiate fire attack on floor involved. • On arrival of A/C, assume appropriate division or reunite with company.*	4
Second Engine	• Back Up Fire Attack • Exposure Protection • Forcible Entry	4
Third Engine	• Rapid Intervention Crew • Establish secondary water supply	4
Fourth Engine	• Per SOG 1 Engine or Truck in staging • Assigned based on incident needs (Assist Fire Attack, Additional RIC, Exposures etc.)	4
First Truck	• Ladders • Ventilation • Utilities	3
Second Truck	• Assist 1st truck with ventilation, ladders • Safety	4
First Rescue	• Search and Rescue	2
Platoon Commander	• Incident Command/Safety	1
Second Rescue	• Medical Group	2
Third Rescue	• Assigned to first truck	2
Total Personnel		30

Figure 129: TFD Critical Tasking for 2nd Alarm Structure Fire

All confirmed structure fires are upgraded to second alarm resource requests. Fires are typically considered confirmed when the dispatch center receives multiple calls, smoke is seen by a responding unit, or the dispatcher is able to confirm a fire through a questioning the caller. All TFD personnel have the authority to upgrade the alarm requests to a second alarm; however, it is typically done by the Platoon Commander or first-in Incident Commander.

Low/Moderate Fire Risk		
Apparatus	Tasks	Personnel
First Engine	• Establish command. • Complete 360 size-up • Establish water supply and pump operations. • Initiate fire attack • Forcible entry on vehicle (for vehicle fires)	4
Total Personnel		4

Figure 130: TFD Critical Tasking for Vehicle Fire

Incident Command-The Incident Commander is the person responsible for all aspects of an emergency response; including quickly developing incident objectives, managing all incident operations, assigning resources based on the risk management plan of the incident action plan, as well as the safety of all emergency personnel.

Fire Attack- An effective fire attack requires a pump operator to deliver effective fire streams using the apparatus mounted pump. A minimum of two firefighters is required to deploy a 1 ¾" hose line capable of delivering 150 gpm or a 2 ½" hose line capable of delivering 250 gpm or more for fire attack.

Forcible Entry – Utilizing power saws and hand tools, firefighters make access into the engine compartment, cabin, and storage areas to ensure fire is extinguished.

(HIGH RISK) EMS-ALS		
Apparatus	Tasks	Personnel
Engine or Truck	• Incident Command • Scene safety • Apparatus placement • Ambulance coordination • BLS skills	2 minimum. In most cases 4 personnel arrive on an engine company, with the exception of the 3-person truck.
Rescue	• ALS patient care • Documentation • Hospital communications	2
Total Personnel		4 or 6

Figure 131: TFD Critical Tasking for EMS-ALS

ALS calls always require a minimum of 2 paramedics capable of providing advanced care in accordance with LA County EMS protocol. In addition to TFD personnel, all calls for EMS receive a private provider ambulance for transportation. The private provider is staffed with a minimum of 2 basic emergency medical technicians.

(MODERATE RISK) EMS-BLS		
Apparatus	Tasks	Personnel
Engine or Truck	• Incident command • Scene safety • Apparatus placement • Ambulance coordination • BLS skills	1 minimum. Can be the Rescue Driver or 1 person from the Engine Company
Rescue	• BLS patient assessment • Documentation • Ambulance communications	1 Firefighter or Paramedic
Total personnel		2

Figure 132: TFD Critical Tasking for EMS-BLS

BLS CAD Call Natures receive an initial dispatch of a rescue and engine or truck company. Once the first arriving unit verifies that the incident only requires BLS treatment and there are no incident factors that require additional personnel, the second responding apparatus may be cancelled by the first arriving unit. In the case of a rescue arriving on scene first and determining the call to only require BLS care, then the 2 paramedics would handle all critical tasks. If an engine arrives first, the critical tasks may be distributed amongst the four personnel to bring the incident to conclusion. If there is any doubt about the need for additional help to accomplish critical tasks in a timely manner, then second responding unit should arrive and apply the ALS critical tasks table.

Hazmat Level 1- Low and Moderate Risks		
Apparatus	Tasks	Personnel
Engine or Truck	• Incident command • Scene safety • I.D & assess • Isolate & deny entry • Minor clean up	4
Total Personnel		4

Figure 133: TFD Critical Tasking for Hazmat Level 1 - Low and Moderate Risk

Hazmat Level 1 Philosophy - A hazardous materials event that can be safely and properly handled with 4 first responder operational personnel. These incidents do not pose an immediate health or safety risk to the community. Examples include identified water based paint in the street, positively identified motor oil etc.

Hazmat Level 2- High risks or Low/Moderate risks that require further expertise		
Apparatus	Tasks	Personnel
First Engine/Truck	• Incident command • Scene safety • I.D & assess • Isolate & deny entry • Support Hazmat Group	4
Second Engine (HM 96)	• Hazmat Group Supervisor • Technical reference • 2 Entry Team members	4
Third Engine (E95)	• Assist Safety Officer-Hazmat (ASOH)Certified • Entry Team Leader • Welfare Person	4
Total Personnel		12

Figure 134: TFD Critical Tasking for Hazmat Level 2 - High Risks or Low/Moderate Risks

Hazmat Level 2 Philosophy – Level 2 Hazardous Materials events require the Hazmat Team (E96, E96) to make entry into the exclusion zone for containment, control, or sampling. TFD has the minimum staffing required by OSHA to make an entry into an exclusion zone.

Hazmat Level 3- Special Risks		
Apparatus	Tasks	Personnel
First Engine	• Incident command • Scene safety • I.D & assess • Isolate & deny entry • Decontamination Team	4
Second Engine	• Hazmat Group Supervisor • Technical reference • 2 Entry Team Members	4
Third Engine	• ASOH • 2 Back Up Team Members • Welfare person	4
Platoon Commander	• Incident Commander • Safety	1
First Rescue	• Medical Group	2
TPD Sergeant	• Law Branch	1
Additional Staff (AC's)	• Contacted for notification purposes only • May assist with general command duties • May assume B92 duties	1
Total Personnel		17

Figure 135: TFD Critical Tasking for Hazmat Level 3 - Special Risks

Hazmat Level 3 Philosophy- Level 3 responses are more dynamic events that will require additional resources to support the incident objectives. While the TFD Hazmat Team has the minimum staffing to make entry legally, it is often a slow process to ensure the entry team is operating in the safest manner possible in accordance with all OSHA regulations. More dynamic incidents such as a rescue or an incident that is affecting the public require a higher sense of urgency and will require assistance from other qualified agencies such as Los Angeles County Fire or Torrance Refining Company Fire Department. The mutual aid allows the incident commander to fill critical positions in the Hazardous Materials Branch with qualified personnel to ensure the safety of the responders and the public. The positions filled are in accordance with the State of California Training and FIRESCOPE.

Technical Rescue- High Special Risks Building Collapse, Confined Space Rescue, Trench Rescue, Hillside/Rope Rescue		
Apparatus	Tasks	Personnel
First Engine	• Incident Command/Safety • Size up • Initial action plan	4
First Truck with USAR	• Rescue Group Supervisor • Minimize hazards • Assign Group Members based on incident needs	3/4
Second Truck	• Assist Rescue Group Supervisor • Assigned as needed based on incident needs	3/4
Platoon Commander	• Incident Commander • Safety	1
First Rescue	• Assigned to first in truck unless immediate medical need	2
Second Rescue	• Medical Group	2
Total Personnel		16

Figure 136: TFD Critical Tasking for Technical Rescue – High Special Risks

Traffic Accident		
Apparatus	Tasks	Personnel
First Engine or Truck	• Establish command • Complete 360 size-up • Call for additional resources if needed • Establish safe working area • Isolate any vehicle hazards (airbags, fuel leaks, etc.) • Triage patients • Provide BLS patient care • Assist with ALS patient care • Coordinate hospital transportation • Remove any vehicle fluids from street	3/4
First Rescue	• ALS Patient Care • Documentation • Hospital communications	2
Total Personnel		5/6

Figure 137: TFD Critical Tasking for Traffic Accident

Note- All traffic accident dispatches also include a private provider EMT staffed ambulance for transportation purposes and a police officer for traffic control and accident investigation.

(MODERATE RISK) Traffic Accident with Entrapment		
Apparatus	Tasks	Personnel
First Engine	• Establish command • Complete 360 size-up • Call for additional resources if needed • Establish safe working area • Isolate any vehicle hazards (airbags, fuel leaks, etc.) • Place a hose line in service • Triage patients • Provide BLS patient care • Assist with ALS patient care • Coordinate hospital transportation • Remove any vehicle fluids from street	4
First Rescue	• ALS patient care • Documentation • Hospital communications	2
First Truck	• Vehicle stabilization • Patient extrication	3 or 4
Platoon Commander	• Incident Command/Safety	1
Second Rescue	• Assist truck with extrication needs	2
Total Personnel		12/13

Figure 138: TFD Critical Tasking for Traffic Accident with Entrapment

Train Derailment-High Risks Hazmat		
Apparatus	Tasks	Personnel
First Engine	• Establish command. • Complete 360 size-up • Address critical components Of AIRICEADDR • Establish water supply and pump operations • On Arrival of A/C, assume appropriate division/group or reunite with Company.*	4
Second Engine	• Assist first in engine as needed • May be assigned Division/Group Supervisor based on incident needs	4
Third Engine (Hazmat)	• Hazmat Group Supervisor • Technical reference • 2 Entry Team Members • Support operational needs	4
Fourth Engine (Hazmat)	• ASOH • 2 Back Up Team Members • Welfare person • Support operational needs	4
First Truck	• Rescue Group Supervisor • Train stabilization	3/4
Second Truck With USAR	• Assigned to first in truck • Support operational needs	3/4
First Rescue	• Assigned to first in truck unless immediate medical need	2
Platoon Commander	• Incident Command/Safety	1
TPD Sergeant	• Law Branch	1
Total Personnel		27

Figure 139: TFD Critical Tasking for Train Derailment – High Risks Hazmat

Aircraft Response		
Apparatus	Tasks	Personnel
First Engine	• Establish command/Safety • Complete 360 size-up • Establish water supply and pump operations • Address fire control concerns • Victim removal • On arrival of A/C, assume appropriate division/group or reunite with company.	4
Second Engine	• Assist first in engine with fire control efforts • Assist incident as Medical Group Supervisor • Assist with patient transportation needs	4
First Truck	• Rescue Group Supervisor • Aircraft stabilization • Assist incident as assigned	3/4
First Rescue	• Assigned to first in truck unless immediate medical need	2
Platoon Commander	• Incident Command/Safety	1
Second Rescue	• ALS patient care • ALS medical communications • Assist incident as assigned	2
TPD Sergeant	• Law Branch	1
Total Personnel		17/18

Figure 140: TFD Critical Tasking for Aircraft Response – High Risks

Section 6 – Deployment and Coverage Performance

The City of Torrance operates a public safety dispatch center that handles both fire and police calls. Emergency calls for service (911 calls) are answered at the public safety answering point by a call taker that is either a sworn police officer or a dispatcher. If the emergency is deemed a "fire only" call, it is immediately transferred to the public safety dispatcher at the fire panel for alarm handling and dispatch. "Code 3-Law/Fire" calls include traffic accidents, man down, significant water main breaks that affect traffic, welfare checks that result in a medical emergency, attempted suicides, shootings, stabbings, assaults, and any other calls warranting the services of both departments. The charts below indicate the 90th percentile performance for TFD for calendar years 2015-2018 on all Code-3 calls and Code-3 calls excluding "law/fire" incidents. The processing of "law/fire" calls is slightly slower and impacts the overall performance of TFD response times.

All Code 3 (Law/Fire) - 90th Percentile Times - Baseline Performance			**2015-2018**	**2018**	**2017**	**2016**	**2015**
Alarm Handling	Pick-up to Dispatch	Urban	1:54	1:53	1:52	1:55	1:54
Turnout Time	Turnout Time 1st Unit	Urban	2:10	2:03	2:17	2:09	2:07
Travel Time	Travel Time 1st Unit **Distribution**	Urban	4:46	4:57	4:52	4:40	4:32
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	7:39 n=52,711	7:49 n=13,168	7:51 n=13,531	7:35 n=13,204	7:21 n=12,808

Figure 141: Code 3 (Law/Fire) 90th Percentile Times - Baseline Performance 2015-2018

Fire Only Code 3 - 90th Percentile Times - Baseline Performance			2015-2017	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	1:47	1:46	1:48	1:48
Turnout Time	Turnout Time 1st Unit	Urban	2:12	2:18	2:10	2:08
Travel Time	Travel Time 1st Unit **Distribution**	Urban	4:32	4:45	4:33	4:22
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	7:22	7:34	7:20	7:13
			n=35,644	n=12,254	n=11,903	n=11487

Figure 142: Code 3 (Fire) 90th Percentile Times - Baseline Performance 2015-2017

Data Set Identification

The data used in the analysis was extracted from the department's record management system (RMS) which is populated with data from the computer aided dispatch (CAD) program that is managed by the Torrance Public Safety Dispatch Center. The RMS data is quality controlled on a daily basis by one of the TFD Administrative Analysts to ensure consistent and accurate reporting. Data outside of set perimeters sends an error message to the Administrative Analyst. Error messages are forwarded to the TFD IT personnel for investigation and correction when necessary. When the investigation reveals the data is accurate, the values that are outside the timeframes remain unchanged. Once the data is approved by the analyst, the RMS data is uploaded into a CAD Analyst and Deployment software program for summary analysis. This analysis is based on data from 1/1/2015 through 12/31/2018.

Data Quality

The establishment of thresholds for Alarm Handling, Turnout, Travel, and Total Response Time is a matter of deciding which data is to be included in an analysis and which is to be excluded. Response time analysis is not perfect science; rather, it is a matter of estimation that favors settling on round numbers that are acceptable within the profession.

The upper threshold is the highest value included in the analysis. All values above that will be excluded from 2018 and beyond. All values equal to or below the lower threshold – which in the case of the intervals analyzed here are only values "null" and missing values- are excluded.

In order to establish the upper and lower thresholds, all interval times needed to be reviewed in the aggregate. However, some limitations were required to ensure that the analysis was based on the correct data. The following parameters were used to limit the analysis:

- Only Code-3 calls were included.
- All permanently staffed apparatus were included in the analysis.
- All incidents that had a "null" value in the en route, arrival, or dispatch time were excluded.
- Mutual aid given was excluded.

The following chart shows the upper threshold limits set for data that is used for deployment modeling purposes from 2018 and beyond. These parameters were set on an evaluation of 40,819 incidents from calendar years 2015-2017.

Time #1	Time #2	Upper Threshold	Percentage Captured
Time Received	Time Dispatched	5 minutes	99.4%
Time Dispatched	Time En Route	5 minutes	99.7%
Time En Route	Time On Scene	15 minutes	99.9%
Time Received	Time On Scene	20 minutes	99.9%

Figure 143: Upper Threshold Limits

Benchmark and Baseline Performance

This section reflects sets benchmark performance objectives as well as baseline system performance. Benchmark standards are goals or performance objectives that the Department aims to meet 90 percent of the time. Baseline performance describe measures that the Department is currently meeting 90 percent of the time.

The following data tables are representative of the Department's baseline (actual) system performance for total response time and benchmark (goal) standards for alarm handling time, turnout time, travel time and total response time for all emergency incidents occurring within Torrance limits for each service type—Fire, EMS, Technical Rescue, and Hazmat. The City of Torrance meets the urban population density standard set forth by the CFAI. The data was, and will continue to be, measured to the 90th percentile for each individual year.

Fire Suppression Benchmark Statement

For 90 percent of all high risk fires, the total response time for the arrival of the first-arriving engine company shall be 6 minutes and 24 seconds. The first-due unit shall be staffed with a minimum of four firefighters, capable of conducting a 360 size-up, establishing command, assigning incoming resources, securing a water source, and initiating rescue or fire attack while meeting the OSHA two in/two out policy.

For 90 percent of all high risk fires, the total response time for the arrival of the effective response force (ERF), staffed with a minimum of 16 operations personnel, shall be 10 minutes and 24 seconds. The ERF shall be capable of establishing a command structure that complies with TFD Strategic Goals of providing for life safety, incident stabilization, and property conservation while providing for firefighters safety, accountability, and welfare. The ERF shall be capable of providing an uninterrupted water supply; advancing an attack line and a backup line for fire control; complying with the Occupational Safety and Health Administration (OSHA) requirements of two in-two out; completing forcible entry; searching and removing victims from harm; providing medical care for the injured, vertically ventilating the structure; controlling utilities; and performing salvage and overhaul. These operations shall be done in accordance with TFD standard operating guidelines.

Fire Baseline Performance Table – High and Special Risk

High Risk Fire - 90th Percentile Times - Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	2:08	2:07	2:11	2:09	2:02
Turnout Time	Turnout Time 1st Unit	Urban	2:11	2:18	2:18	2:07	2:04
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:01	5:20	4:44	5:06	4:43
	Travel Time ERF **Concentration**	Urban	9:46	9:02	10:48	10:20	7:52
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	7:56	8:05	8:09	8:45	7:20
			n=592	n=138	n=130	n=166	n=158
	Total Response Time ERF **Concentration**	Urban	13:27	12:27	14:07	12:59	13;10
			n=232	n=59	n=50	n=61	N=62

Figure 144: Structure Fire - 90th Percentile Times Baseline Performance 2015-2018

Fire Suppression Baseline Performance Measures

Over the period of 2015-2018, for 90 percent of all high risk fires, the total response time for the arrival of the first-due unit, staffed with four personnel including a Captain, Engineer, and two Firefighters is **7 minutes and 56 seconds**. The first-due unit was capable of conducting a 360 size-up, establishing command, assigning incoming resources, securing a water source, and initiating rescue or fire attack while meeting the OSHA two in/two out policy. These operations were completed in accordance with departmental standard operating guidelines while providing for the safety of responders and the public.

For 90 percent of all high risk fires, the total response time for the arrival of the ERF, staffed with 16 firefighters and officers is **13 minutes and 27 seconds**. The ERF was capable of providing an uninterrupted water supply; advancing an attack line and a backup line for fire control; complying with the Occupational Safety and Health Administration (OSHA) requirements of two in-two out; completing forcible entry; searching and removing victims from harm; providing medical care for the injured, vertically ventilating the structure; controlling utilities; and performing salvage and overhaul. These operations were done in accordance with TFD standard operating guidelines.

For 90 percent of all second alarm from 2015-2018, the total response time for the arrival of the second alarm ERF, staffed with 30 firefighters was **15 minutes and 49 seconds**. The count for 2nd alarm ERF was a relatively low count at 39 total incidents.

TFD dispatches the same initial alarm assignments to all reported structure fires regardless of risk levels. Any reported structure fires that receive multiple calls or a confirmation of an active fire will be immediately upgraded to a second alarm assignment resulting in a 2 additional engines, another truck, a rescue, and a notification to all Chief Officers.

In 2017, TFD added an additional rescue to the first alarm structure fire responses which resulted in a longer total response time baseline performance related to effective response force. This adjustment was implemented to ensure the three-person truck is assigned additional personnel to assist with their operations. The relatively low number of total response times for ERF is the result of the first unit arriving on scene, evaluating the situation, and cancelling incoming units when they are not needed on the incident.

Low and Moderate Risk Fire Suppression Benchmark Performance Measure

For 90 percent of all low and moderate risk fires, the total response time for the arrival of the first-arriving engine company shall be 6 minutes and 24 seconds. The first-due unit shall be and engine-company staffed with a minimum of four firefighters, capable of completing a 360 size-up, establishing command, evaluating the need for additional resources, making access to the fire area using forcible entry techniques, establishing a water supply and advancing a fire attack with sufficient gpm to extinguish the fire. These operations are completed in accordance with departmental standard operating guidelines while providing for the safety of responders and the public.

For low/moderate risk fires the TFD's ERF is a single engine company assignment with apparatus capable of providing 1,500 gallons per minute pumping capability and be able to accomplish the necessary tasks to prevent the fire from spreading to exposures.

Low and Moderate Risk Fire Baseline Performance Table

Low/Mod Risk Fire - 90th Percentile Times - Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	2:12	2:06	2:18	2:11	2:11
Turnout Time	Turnout Time 1st Unit	Urban	2:51	2:55	3:01	2:43	2:38
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:19	5:20	5:19	5:19	5:18
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	8:48	9:05	8:57	8:32	8:42
			n=605	n=146	n=130	n=169	N=160

Figure 145: Low/Mod Risk Fire - 90th Percentile Times – Baseline Performance

Low and Moderate Risk Fire Suppression Baseline Performance Measures

Over the period of 2015-2018, For 90 percent of all low and moderate risk fires, the total response time for the arrival of the first-due unit is **8 minutes and 48 seconds**. The first-due unit was staffed with 1 Company Officer, 1 Pump Operator, and 2 Firefighters capable of completing a 360 size-up, establishing command, evaluating the need for additional resources, making access to the fire area using forcible entry techniques, establishing a water supply and advancing a fire attack with sufficient gpm to extinguish the fire. These operations were completed in accordance with departmental standard operating guidelines while providing for the safety of responders and the public.

Fire Alarm Benchmark Performance Benchmark

For 90 percent of all fire alarms, the total response time for the arrival of the first-arriving engine company shall be 10 minutes and 24 seconds. The first-due unit shall be an Engine or Truck Company staffed with a minimum of three personnel, capable of evaluating the need for additional resources, establishing command, investigating alarm cause and correcting the problem.

For 90 percent of all fire alarms, the total response time for the arrival of the effective response force (ERF), staffed with 3 Firefighters shall be 10 minutes and 24 seconds. Fire alarms are considered non-emergency calls unless the first-in company deems the situation requires a Code 3 response. If the dispatcher or first-in company feels the initial report may be an active fire incident, the alarm will be upgraded to a first alarm structure fire response.

Fire Alarm Baseline Performance Measures Table

Fire Alarms - 90th Percentile Times - Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	2:38	2:35	2:30	2:39	2:47
Turnout Time	Turnout Time 1st Unit	Urban	3:05	3:23	3:24	2:52	2:29
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:10	5:27	5:32	4:41	5:01
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	9:16	9:32	9:51	8:54	8:41
			n=1992	n=422	n=505	n=577	N=488

Figure 146: Fire Alarms - 90th Percentile Times - Baseline Performance

Fire Alarm Baseline Performance Benchmark

For 90 percent of all fire alarms, the total response time for the arrival of the first-arriving engine company was **9 minutes and 16 seconds.** The first-due unit shall be an Engine or Truck Company staffed with a minimum of three personnel, capable of evaluating the need for additional resources, establishing command, investigating alarm cause and correcting the problem.

EMS-ALS Benchmark Performance Measures

For 90 percent of all advanced life support (ALS) EMS incidents, the total response time for the arrival of the first-arriving unit shall be 6 minutes and 4 seconds. The first-due unit shall be staffed with a minimum of 2 paramedics or 3 emergency medical technicians. The first-due unit shall be capable of assessing scene safety, establishing command, evaluating the need for additional resources, conducting an initial patient assessment, initiating basic life support, and initiating early defibrillation.

For 90 percent of all ALS EMS incidents, the total response time for the arrival of the effective response force (ERF), staffed with 4 operations personnel shall be 6 minutes and 4 seconds. The ERF shall be capable of conducting a comprehensive patient assessment; obtaining vitals and a detailed medical history of the patient; initiating advanced life support actions in accordance with Los Angeles County EMS protocol; assisting transport personnel with packaging the patient; and caring for the patient until care is transferred to an equal or higher medical authority at the receiving hospital. The transportation unit is a third party vendor that shall arrive on scene within 8 minutes from time of dispatch 92 percent of the time.

(HIGH RISK) EMS-ALS Baseline Performance Table

EMS-ALS - 90th Percentile Times - Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	1:40	1:43	1:39	1:39	1:38
Turnout Time	Turnout Time 1st Unit	Urban	1:55	1:50	2:01	1:52	1:56
Travel Time	Travel Time 1st Unit **Distribution**	Urban	4:33	4:42	4:36	4:31	4:18
	Travel Time ERF **Concentration**	Urban	4:09	4:14	4:10	4:05	4:05
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	7:05	7:19	7:08	7:00	6:51
			n=22,957	n=5934	n=5857	n=5604	n=5562
	Total Response Time ERF **Concentration**	Urban	8:52	9:17	8:57	8:47	8:22
			n=22796	n=5789	n=5872	n=5592	n=5543

Figure 147: EMS-ALS 90th Percentile Times - Baseline Performance 2015-2018

EMS-ALS Baseline Performance Measures

Over the period of 2015-2018, for 90 percent of all ALS EMS incidents, the total response time for the arrival of the first-arriving unit was **7 minutes and 05 seconds**. The first-due unit was staffed with a minimum of 2 paramedics or 3 emergency medical technicians. The first-due unit was capable of establishing command, evaluating the need for additional resources, initiating basic life support, and early defibrillation.

For 90 percent of all ALS EMS incidents, the total response time for the arrival of the effective response force (ERF), staffed with 2 paramedics and a minimum of 4 operations personnel was **8 minutes and 52 seconds**. The ERF was capable of conducting a comprehensive patient assessment; obtaining vitals and a detailed medical history of the patient; initiating advanced life support actions in accordance with Los Angeles County EMS protocol; assisting transport personnel with packaging the patient; and caring for the patient until care was transferred to an equal or higher medical authority at the receiving hospital.

EMS-BLS Benchmark Performance Measures

For 90 percent of all basic life support (BLS) EMS incidents, for 90 percent of all basic life support EMS incidents, the total response time for the arrival of the first-arriving unit shall be 6 minutes and 4 seconds. The first-due unit shall be staffed with a minimum of 2 paramedics or 3 emergency medical technicians (EMTs). The first-due unit shall be capable of establishing command, evaluating the need for additional resources, initiating basic life support, and initiating early defibrillation.

For 90 percent of all BLS EMS incidents, the total response time for the arrival of the effective response force (ERF), staffed with a minimum of 2 paramedics or 3 EMT's shall be 6 minutes and 4 seconds. The effective response force shall be capable of conducting a comprehensive patient assessment; obtaining vitals and a detailed medical history of the patient; initiating basic life support actions in accordance with Los Angeles County EMS protocol; and assisting transport personnel with packaging the patient for a safe ride to the local hospital. The transportation unit is a third party vendor that shall arrive on scene within 8 minutes from time of dispatch to on scene 92 percent on the time.

(MODERATE RISK) EMS-BLS Baseline Performance Table

EMS-BLS – 90th Percentile Times – Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	1:36	1:38	1:37	1:36	1:32
Turnout Time	Turnout Time 1st Unit	Urban	1:55	1:49	2:04	1:51	1:57
Travel Time	Travel Time 1st Unit **Distribution**	Urban	4:39	4:51	4:46	4:32	4:24
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	7:06	7:14	7:16	7:01	6:52
			n=18,235	n=4603	n=4698	n=4543	N=4391

Figure 148: EMS-BLS -90th Percentile Times - Baseline Performance 2015-2018

EMS-BLS Baseline Performance Measures

Over the period of 2015-2018, the total response time for the arrival of the first-arriving unit was **7 minutes and 06 seconds**. The first-due unit was staffed with a minimum of 2 paramedics or 3 emergency medical technicians. The ERF shall be capable of conducting a comprehensive patient assessment; obtaining vitals and a detailed medical history of the patient; initiating basic life support actions in accordance with Los Angeles County EMS protocol; and assisting transport personnel with packaging the patient for a safe ride to the local hospital.

Traffic Accident Benchmark Performance Measures

For 90 percent of all traffic accident incidents, the total response time for the arrival of the first-arriving company shall be 6 minutes and 24 seconds. The first-due unit shall be staffed with a minimum of 3 Firefighter rank or above EMT's or 2 paramedics, capable of establishing a safe work area, conducting a 360 size- up, establishing command, evaluating the need for additional resources, and controlling immediate hazards.

For 90 percent of all traffic accident incidents, the total response time for the arrival of the effective response force (ERF), staffed with 2 paramedics and 3 EMT's, shall be 6 minutes and 24 seconds. The effective response force shall be capable of providing ALS patient care, hazard control, and coordinating patient transportation to the appropriate receiving hospital.

TFD tracks and reports Traffic Accidents separate from Emergency Medical Services incidents due to the differing turnout time benchmarks. For responder safety, the TFD requires responders to don firefighter turnouts prior to responding to traffic accidents with a turnout benchmark time of 80 seconds, rather than 60 seconds for EMS calls. Including Traffic Accidents in the EMS response time performance would skew the response time data. This excludes traffic accidents categorized as moderate risk technical rescues.

Traffic Accident Baseline Performance Table

Traffic Accidents – 90th Percentile Times – Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	2:09	2:06	2:09	2:08	2:10
Turnout Time	Turnout Time 1st Unit	Urban	2:08	2:00	2:15	2:08	2:05
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:10	5:24	5:28	4:59	4:42
	Travel Time ERF **Concentration**	Urban	6:01	6:34	5:49	5:52	5:29
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	8:11	8:28	8:32	8:03	7:39
			n=4064	n=917	n=1009	n=1041	n=1097
	Total Response Time ERF **Concentration**	Urban	10:45	10:59	11:37	10:19	10:17
			n=3504	n=759	n=859	n=922	n=464

Figure 149: Traffic Accidents - 90th Percentile Times - Baseline Performance 2015-2018

Traffic Accident Baseline Performance Measures

For 90 percent of all traffic accident incidents, the total response time for the arrival of the first-arriving company was **8 minutes and 11 seconds**. The first-due unit shall be staffed with a minimum of 3 Firefighter rank or above EMT's or 2 paramedics, capable of establishing command, evaluating the need for additional resources, and controlling immediate hazards.

For 90 percent of all traffic accident incidents, the total response time for the arrival of the effective response force (ERF), staffed with 2 paramedics and 3 EMT's, was **10 minutes and 45 seconds.** The effective response force shall be capable of hazard control, patient stabilization, and transport.

Low and Moderate Risk Hazardous Materials Benchmark Performance Measures

For 90 percent of all low and moderate risk hazardous materials, the total response time for the arrival of the first-arriving company shall be 10 minutes and 24 seconds. The first-due unit shall be staffed with a minimum of 3 firefighters assigned to a truck or 4 firefighters assigned on an engine, capable of establishing command, evaluating the need for additional resources, recognizing hazardous materials risks, and taking defensive actions to prevent harm to people, property, and the environment. All personnel must be trained to First Responder Operational level in accordance with Title 29 Code of Federal Regulations 1910.120 and the California Code of Regulations, Title 8, Section 5192, Paragraph Q. Tasks that shall be accomplished include locating personnel in a safe area, researching and gathering situational awareness related to the incident and hazardous material, identifying potential victims and opportunities for rescues, isolating and denying entry into the exclusion zone, building dams and dikes away from the hazard, evacuating and sheltering potential victims, coordinating with regulatory agencies, and providing any decontamination necessary.

For 90 percent of all low and moderate risk hazardous materials incidents, the total response time for the arrival of the effective response force (ERF), staffed with a minimum of 3 firefighters assigned to a truck or 4 firefighters assigned on an engine shall be 10 minutes and 24 seconds. The ERF for these incidents is a single resource capable of establishing command, evaluating the need for additional resources, recognizing hazardous materials risks, and taking defensive actions to prevent harm to people, property, and the environment.

Low/Moderate Hazardous Materials Baseline Performance Table

Low/Moderate Risk Hazmat- 90th Percentile- Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	3:05	3:01	2:56	3:18	2:55
Turnout Time	Turnout Time 1st Unit	Urban	2:59	3:04	2:49	2:50	3:03
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:59	5:32	6:15	5:50	5:02
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	10:31	10:03	10:25	10:34	9:42
			n=569	n=132	n=162	n=151	n=124

Figure 150: Low/Moderate Risk Hazmat - 90th Percentile Baseline Performance 2015-2018

Low and Moderate Risk Hazardous Materials Baseline Performance Measures

For 90 percent of all low and moderate risk hazardous materials, the total response time for the arrival of the first-arriving company was 10 minutes and 31 seconds. The ERF for these incidents is a single resource capable of establishing command, evaluating the need for additional resources, recognizing hazardous materials risks, and taking defensive actions to prevent harm to people, property, and the environment.

The incident numbers were derived from CAD call natures for odor complaints, hazmat, release/leak, unknown substance, and spills. TFD excluded CAD call nature "natural gas leak non-structure" and reported it under utility emergencies baseline performance. For calendar years 2015-2017, the analysis also revealed that 34% of the responses were Code 2 indicating a decreased sense of urgency. Company Officers are encouraged to reduce the number of Code 3 response for public and responder safety when the situation warrants.

High/Special Risk Hazardous Materials Benchmark Performance Measures

For 90 percent of all high/special risk hazardous materials, the total response time for the arrival of the first-arriving company shall be 6 minutes and 24 seconds. The first-due unit shall be staffed with a minimum of 3 firefighters assigned to a truck or 4 firefighters assigned on an engine, capable of establishing command, evaluating the need for additional resources, recognizing hazardous materials risks, and taking defensive actions to prevent harm to people, property, and the environment. All personnel must be trained to First Responder Operational level in accordance with Title 29 Code of Federal Regulations 1910.120 and the California Code of Regulations, Title 8, Section 5192, Paragraph Q.

For 90 percent of all high/special risk hazardous materials incidents, the total response time for the arrival of the effective response force (ERF), staffed with 12 personnel and including the Hazmat vehicle shall be 10 minutes and 24 seconds. Incidents that involve rescue in the exclusion zone or an airborne product affecting public health should warrant a request for mutual aid hazardous materials teams early in the incident. The high-risk Haz Mat ERF shall be capable of entering the exclusion zone with chemical protective clothing, plugging and patching leaks, performing air monitoring within the exclusion zone and surrounding areas, and providing technical assistance expertise to the responsible party.

High/Special Risk Hazardous Materials Baseline Performance Measures

For the calendar years 2015-2017, the TFD responded on a total of 8 high or special risk hazardous materials incidents rendering the 90th percentile analysis less than ideal for this sample size. Therefore, in accordance with the Commission of Fire Accreditation International's Interpretation Guide for the 9th Edition of the Fire & Emergency Services Self-Assessment Manual (Page 103) a baseline performance table will not be included in the Standards of Cover. At a minimum the CFAI recommends an aggregate set of 10 data points before an analysis is valid.

Technical Rescue Benchmark Performance Measures

For 90 percent of all low and moderate risk technical rescue incidents, the total response time for the arrival of the first-arriving company and the effective response force shall be 6 minutes and 24 seconds. The first-due unit shall be staffed with a minimum of three firefighters, capable of conducting a 360 size-up, establishing command, evaluating the need for additional resources, and controlling immediate hazards. In addition, the personnel shall be capable of accessing stuck elevators, accessing locked vehicles, and stabilizing compromised structures. These operations are completed in accordance with departmental standard operating guidelines while providing for the safety of responders and the public.

Low and Moderate Technical Rescue Performance Table

Low/Moderate Risk Technical Rescue- 90th Percentile- Baseline Performance			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	1:52	1:51	1:49	1:51	2:00
Turnout Time	Turnout Time 1st Unit	Urban	2:26	2:42	2:22	2:19	2:18
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:09	5:30	4:59	4:37	5:14
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	8:13	8:39	8:00	7:59	8:13
			n=584	n=140	n=171	n=133	n=140

Figure 151: Low/Moderate Risk Technical Rescue – 90th Percentile – Baseline Performance 2015-2018

Low and Moderate Risk Technical Rescue Baseline Performance Measures

For 90 percent of all low and moderate risk technical rescue incidents, the total response time for the arrival of the first-arriving company was **8 minutes and 13 seconds**. The first-due unit was staffed with a minimum of three firefighters, capable of conducting a 360 size-up, establishing command, evaluating the need for additional resources, and controlling immediate hazards. In addition, the personnel were capable of accessing stuck elevators, accessing locked vehicles, and stabilizing compromised structures.

High and Special Risks Technical Rescue Benchmark Performance Measures

For 90 percent of all high and special risk technical rescues, the total response time for the arrival of the first-arriving company shall be 6 minutes and 24 seconds. The first-due unit shall be staffed with a minimum of 3 firefighters assigned to a truck or 4 firefighters assigned on an engine, capable of establishing command, evaluating the need for additional resources, evaluate and control the hazards, and taking action to prevent harm to people.

For 90 percent of all high and special risk technical rescue incidents, the total response time for the arrival of the effective response force (ERF), staffed with 16 personnel and 1 Platoon Commander, shall be 10 minutes and 24 seconds. The ERF shall be capable of appointing a qualified site safety officer; establishing patient contact; staging and apparatus set up; providing technical expertise, knowledge, skills, and abilities (KSA's) during technical rescue incidents; and providing first responder medical support. The technical KSA's and associated task will vary depending on the specific nature of the hazard present.

High and Special Risk Technical Rescue Baseline Performance Measures

For the calendar years 2015-2017, the TFD responded on a total of 6 high or special technical rescue incidents rendering the 90th percentile analysis less than ideal for this sample size. Therefore, in accordance with the Commission of Fire Accreditation International's Interpretation Guide for the 9th Edition of the Fire & Emergency Services Self-Assessment Manual (Page 103) a baseline performance table will not be included in the Standards of Cover. At a minimum the CFAI recommends an aggregate set of 10 data points before an analysis is valid. The 6 incidents were found by a CAD query of incident call nature's trench rescue, technical rescue, trench collapse, building collapse, and rope rescue. The department has on occasion made a special request for the USAR vehicle to assist with stabilizing or boarding up a building following another incident type. For instance, a vehicle into a building is reported as a traffic accident under response performance; however, the Incident Commander may request the USAR vehicle to assist with tools and equipment. In this case, the vehicle is cross staffed with personnel off of T96.

Airport Emergencies Benchmark Performance Measures

For 90 percent of all airport emergency incidents, the total response time for the arrival of the first-arriving company shall be 6 minutes and 24 seconds. The first-due unit shall be staffed with a minimum of 4 firefighters assigned on an engine, capable of establishing command, evaluating the need for additional resources, extinguishing a fire, and taking action to prevent harm to people.

For 90 percent of all airport emergency incidents, the total response time for the arrival of the effective response force (ERF), staffed with 17 personnel 1 Platoon Commander, and 1 TPD Sergeant shall be 10 minutes and 24 seconds. The ERF shall be capable of appointing a qualified site safety officer; stabilizing the aircraft, extricating any trapped victims, conducting fire suppression activities, and triaging, treating, and transporting any victims.

If at any time the incident commander feels the situation dictates additional resources, they are encouraged upgrade the alarm to meet the needs of the incident. For example, a high risk airport response would require a first alarm structure fire dispatch assignment.

Airport Emergencies Baseline Performance Table

Airport Emergencies			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	1:45	:42	:51	1:44	1:13
Turnout Time	Turnout Time 1st Unit	Urban	2:56	3:02	2:06	2:54	2:15
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:31	1:59	1:43	5:31	5:07
	Travel Time ERF **Concentration**	Urban	:00	:00	:00	:00	:00
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	9:26	5:43	4:40	9:21	7:56
			18	1	2	10	5
	Total Response Time ERF **Concentration**	Urban	:00	:00	:00	:00	:00
			n=0	n=0	n=0	n=0	n=0

Figure 152: Airport Emergencies Baseline Performance 2015-2018

Airport Emergencies Baseline Performance Measures

For 90 percent of all airport emergency incidents, the total response time for the arrival of the first-arriving company and for the effective response force time was 9 minutes and 26 seconds. This is based upon a small data set of 18 total incidents. Small data sets can create a lack of confidence in predicting future performance with great confidence.

For 90 percent of all airport emergency incidents, the total response time for the arrival of the effective response force (ERF) including 2 engines, 1 truck, 2 rescues, 1 Platoon Commander, and 1 TPD Sergeant was unreportable, based upon the fact that an effective response force was never required to arrive on scene to mitigate an incident. This performance does not provide a significant indicator of future performance for effective response force in relation to airport emergencies.

Gas/Electrical Hazard Benchmark Performance Benchmark

For 90 percent of all gas/electrical emergencies, the total response time for the arrival of the first-arriving engine company shall be 6 minutes and 24 seconds. The first-due unit shall be an Engine or Truck Company staffed with a minimum of 3 personnel, capable of evaluating the need for additional resources, establishing command, securing a safe area, notifying outside agencies, and/or safely securing the utility hazard. The effective response force is a single engine or truck with a minimum of 3 personnel. If at any time the incident commander feels the situation dictates additional resources, they are encouraged upgrade the alarm to meet the needs of the Incident.

Gas/Electrical Emergency Performance Table

Low and Moderate Gas/Electrical Emergencies			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	2:18	2:25	2:08	2:08	2:15
Turnout Time	Turnout Time 1st Unit	Urban	2:58	3:06	3:11	2:52	2:48
Travel Time	Travel Time 1st Unit **Distribution**	Urban	5:42	6:03	5:25	5:20	5:47
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	9:25	9:31	9:23	8:57	9:27
			n=754	n=187	n=167	n=235	n=165

Figure 153: Low and Moderate Gas/Electrical Emergencies Performance 2015-2018

Gas/Electrical Emergency Baseline Performance Measures

Over the period of 2015-2018, for 90 percent of all gas/electrical emergency incidents, the total response time for the arrival of the first-arriving company and the effective response force was **9 minutes and 25 seconds.**

Miscellaneous Code 3 Performance Baseline

The below table includes CAD call natures that typically are considered less urgent; however, based upon situational awareness, the first-in officer chose to upgrade to a Code-3 responses. Additionally, the response number below are not included of the previous Standards of Cover performance tables. These incidents include CAD call natures for inside water problem, outside water problems, investigations, bees, single engine report only, fireworks, and citizen assist. The total CAD count for these call natures was 3442. TFD unit's responded Code-3 57% of the time on these call natures.

Miscellaneous Code 3 Response Table

Miscellaneous Code 3 Responses			2015-2018	2018	2017	2016	2015
Alarm Handling	Pick-up to Dispatch	Urban	2:39	2:27	2:31	2:38	3:13
Turnout Time	Turnout Time 1st Unit	Urban	3:04	3:04	3:05	3:02	2:55
Travel Time	Travel Time 1st Unit **Distribution**	Urban	6:33	6:57	6:33	6:43	5:44
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	10:50	10:45	11:07	10:59	10:12
			n=1928	n=506	n=667	n=430	n=325

Figure 154: Miscellaneous Code 3 Responses 2015-2018

Unit Hour Utilization

Unit Hour Utilization (UHU) refers to the amount of time a unit spends on emergency incidents in a 24-hour period. It is a factor in determining "how busy is busy?" This data can be used in conjunction with travel time performance to evaluate the distribution and concentration of resources required to meet the community's response time and effective response force goals. No national standard is available as a benchmark; however, many trade journals and professional articles indicate that less than 10% UHU is desirable. At 10%, the community has a 90% chance of timely emergency service. "*Many industry professionals believe 30% is the "line in the sand" for UHU. At 30% the community has less than a 70 percent chance of timely emergency service. Personnel assigned to units at or exceeding 30% demonstrate signs of fatigue and burnout resulting in an increased risk of errors. Additionally, at 30% required training and physical fitness sessions are not consistently completed*" (Fire Engineering, May 2016). Fortunately, no TFD units are approaching the 30% threshold value. The table below shows the UHU by unit based on average per day in hours, minutes, and seconds. The table also includes the average percentage of time a unit is committed to an emergency incident rounded to the nearest whole number.

Unit	Average UHU Per day 2015 (hh:mm:ss)	Average UHUs per Day in 2015 (as a percentage)	Average UHU Per day 2016 (hh:mm:ss)	Average UHUs per Day in 2016 (as a percentage)	Average UHU Per day 2017 (hh:mm:ss)	Average UHUs per Day in 2017 (as a percentage)
B91	00:22:16	2%	00:17:25	1%	00:11:47	1%
E91	01:20:26	6%	01:22:18	6%	01:22:04	6%
E92	01:21:49	6%	01:23:41	6%	01:26:39	6%
E93	01:26:56	6%	01:37:05	7%	01:35:46	7%
E94	01:03:25	4%	01:03:46	4%	01:04:53	5%
E95	01:36:12	7%	01:44:05	7%	01:45:29	7%
E96	01:33:23	6%	01:42:58	7%	01:56:33	8%
E97	01:25:44	6%	01:37:14	7%	01:28:38	6%
R91	03:12:47	13%	03:37:25	15%	03:54:46	16%
R93	02:24:44	10%	02:31:39	11%	02:43:28	11%
R94	02:34:33	11%	02:40:31	11%	02:53:02	12%
R95	02:45:32	11%	02:51:30	12%	03:12:50	13%
R96	02:53:56	12%	02:56:44	12%	03:15:34	14%
T91	00:29:47	2%	00:26:57	2%	00:31:57	2%
T96	00:39:04	3%	00:42:00	3%	00:35:49	2%

Figure 155: TFD UHU (Unit Hour Utilization) 2015-2017

It is important to understand the UHU, is only measuring time assigned on an emergency. The TFD's overarching goal is to reduce emergencies through risks reduction efforts. All of the above units are involved in a wide variety of risk reduction efforts on a daily basis.

Code-3 Response Time Performance Maps

The map below provides a visual indicator of where TFD baseline performance by ¼ mile CAD quadrants for calendar years 2015-2018. This map accounts for 52,711 Code 3 responses. Areas in dark green are within the performance benchmark while areas in red are meeting the benchmark on less than 20% of all Code 3 responses. The legend below provides further clarification on the map colors. Overall TFD is 75% in compliance with the Code 3 total response time benchmark standards. The following pages indicate the same performance data specific to each planning zone.

Overview of entire City

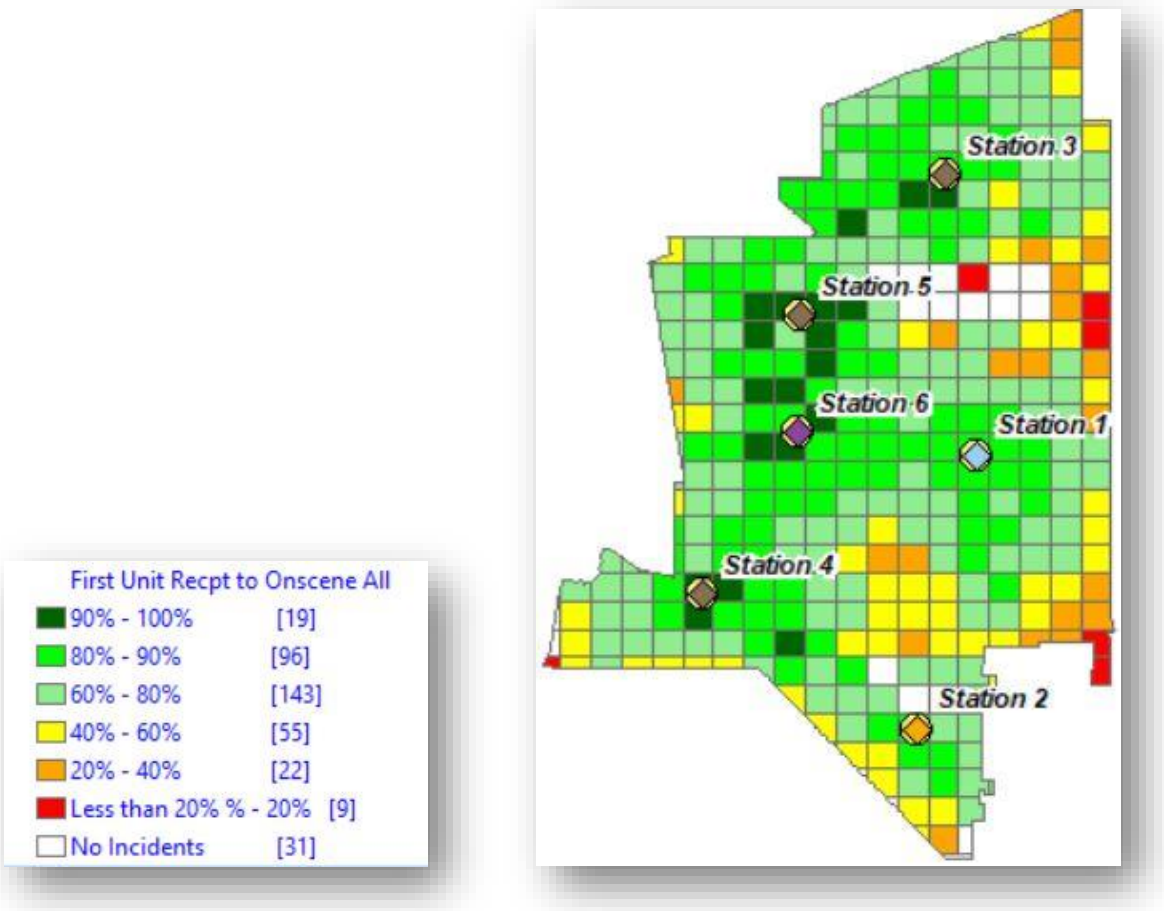


Figure 156: TFD Overall Code 3 Response Time Performance Map

Planning Zone 91

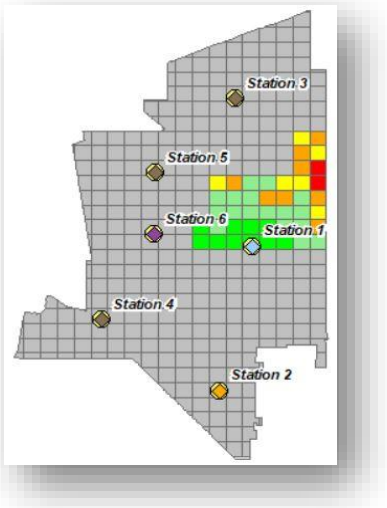


Figure 157: Planning Zone 91 - TFD 90th Percentile Response Time Performance

The above map visually indicates the performance of TFD at the 90th percentile for total response time performance within Planning Zone 91. The 90th percentile baseline time is **7 minutes and 56 seconds**. TFD units responded in compliance with the benchmark **73%** of the time in Planning Zone 91.

Planning Zone 92

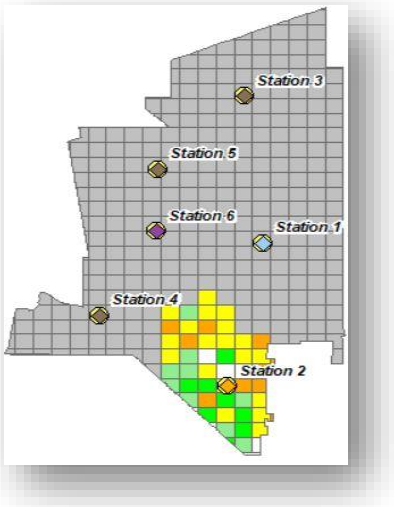


Figure 158: Planning Zone 92 - TFD 90th Percentile Response Time Performance

The above map visually indicates the performance of TFD at the 90th percentile for total response time performance within Planning Zone 92. The 90th percentile baseline time is **7 minutes and 59 seconds.** TFD units responded in compliance with the benchmark **66%** of the time in Planning Zone 92.

Planning Zone 93

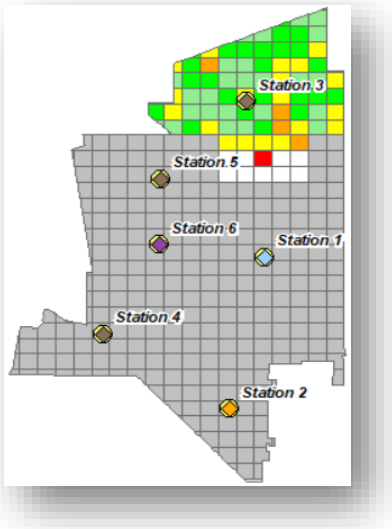


Figure 159: Planning Zone 93 - TFD 90th Percentile Response Time Performance

The above map visually indicates the performance of TFD at the 90th percentile for total response time performance within Planning Zone 93. The 90th percentile baseline time is **7 minutes and 57 seconds.** TFD units responded in compliance with the benchmark **73%** of the time in Planning Zone 93.

Planning Zone 94

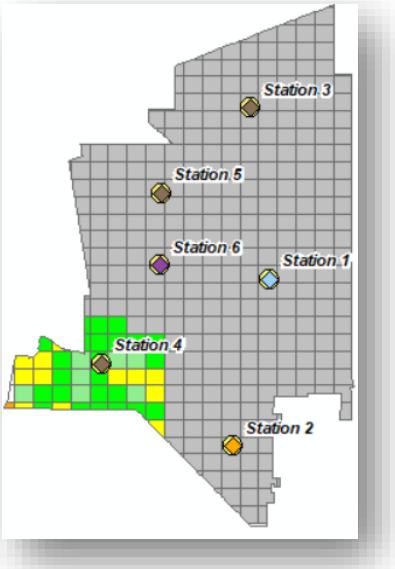


Figure 160: Planning Zone 94 - TFD 90th Percentile Response Time Performance

The above map visually indicates the performance of TFD at the 90th percentile for total response time performance within Planning Zone 94. The 90th percentile baseline time is **7 minutes and 34 seconds**. TFD units responded in compliance with the benchmark **77%** of the time in Planning Zone 94.

Planning Zone 95

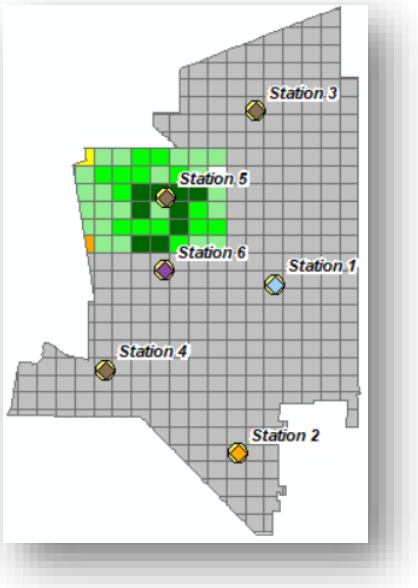


Figure 161: Planning Zone 95 - TFD 90th Percentile Response Time Performance

The above map visually indicates the performance of TFD at the 90th percentile for total response time performance within Planning Zone 95. The 90th percentile baseline time is **6 minutes and 57 seconds**. TFD units responded in compliance with the benchmark **84%** of the time in Planning Zone 95.

Planning Zone 96

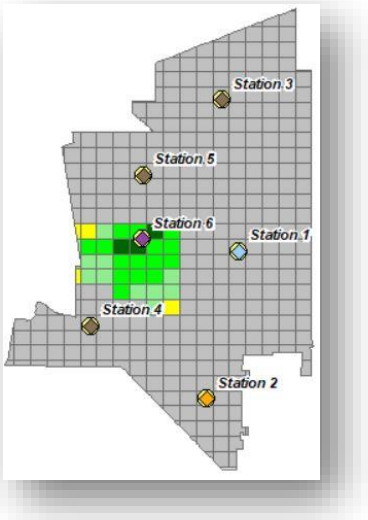


Figure 162: Planning Zone 96 - TFD 90th Percentile Response Time Performance

The above map visually indicates the performance of TFD at the 90th percentile for total response time performance within Planning Zone 96. The 90th percentile baseline time is **7 minutes and 06 seconds**. TFD units responded in compliance with the benchmark **81%** of the time in Planning Zone 96.

Planning Zone 97

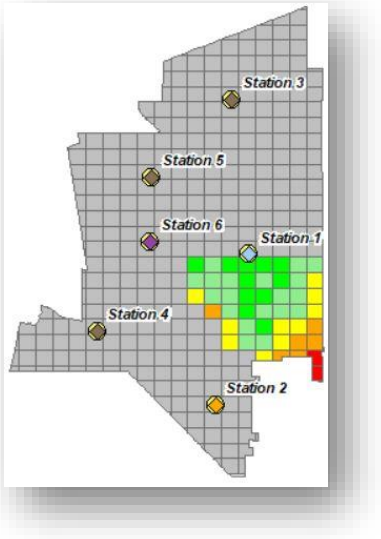


Figure 163: Planning Zone 97 - TFD 90th Percentile Response Time Performance

The above map visually indicates the performance of TFD at the 90th percentile for total response time performance within Planning Zone 97. The 90th percentile baseline time is **7 minutes and 57 seconds**. TFD units responded in compliance with the benchmark **67%** of the time in Planning Zone 97.

First Truck Code-3, 8 Minute Benchmark Travel Time Map

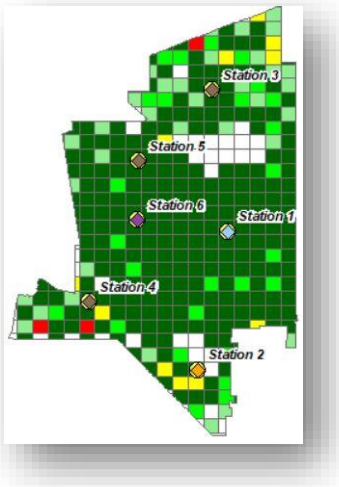


Figure 164: Fire Truck Code 3 - TFD 90th Percentile Response Time Performance

The above map visually indicates the 8-minute benchmark travel time performance for truck companies at the 90th percentile for the entire city. The 90th percentile baseline **travel time was 6 minutes and 35 seconds.** TFD trucks responded in compliance with the **8-minute benchmark 95% of the time.**

First Engine Code-3, 4 Minute Benchmark Travel Time Map

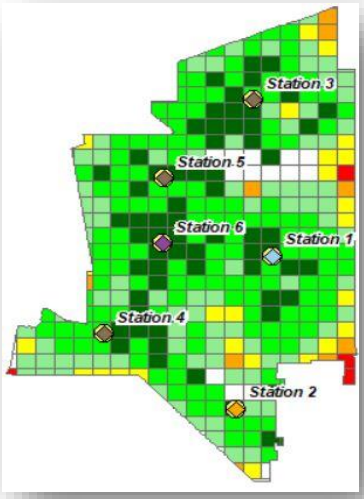


Figure 165: First Engine Code 3 - TFD 90th Percentile Response Time Performance

The above map visually indicates the 4-minute benchmark travel time performance for engine companies at the 90th percentile for the entire city. The 90th percentile baseline **travel time was 4 minutes and 41 seconds.** TFD engine companies responded in compliance with **the 4-minute travel time benchmark 82% of the time.**

Rescue Code-3, Total Response Time Map

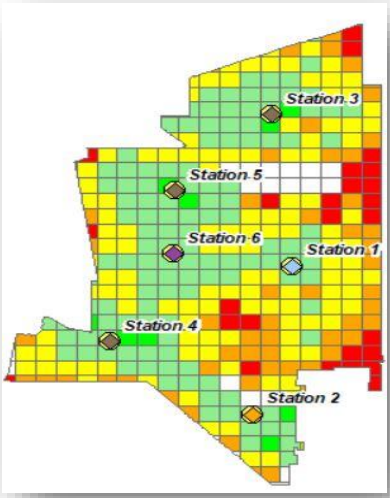


Figure 166: Rescue Code 3 - TFD 90th Percentile Response Time Performance

The above map visually indicates the 6-minute 4 second benchmark total response time performance for rescues at the 90th percentile for the entire city. The 90th percentile baseline **total response time was 8 minutes and 51 seconds.** TFD rescues responded in compliance with **the total response time benchmark 58% of the time.**

Section 7 – Findings and Recommendations

The Torrance Fire Department has a long and proud tradition of providing excellent service. In 2016, the TFD embarked on the accreditation journey using the Commission of Fire Accreditation's (CFAI) model to ensure continuous improvement, resulting in better outcomes for the community served. The process of developing the CRA-SOC has provided the platform for gathering data, ensuring it was valid, and analyzing the meaning of the data in order to move into a better future. The below findings and recommendations are the results of the CRA-SOC development process. These findings and recommendations, coupled with the 2018-2023 TFD Strategic Plan and the Self-Assessment Manual, places policymakers and TFD leadership in a position to make data driven decisions in regards to funding, deployment, program development, staffing, and a variety of other important initiatives. The TFD recognizes that providing Fire and EMS services comes at a significant cost to the City's budget; therefore, it is critical to be transparent and justify every penny spent through data and analysis.

The following items are key findings that were found during the analysis of the CRA-SOC

Finding #1

Conducting a comprehensive Community Risk Assessment and Standards of Cover is a new concept for the TFD which has resulted in concern from some members. In order to increase community and TFD "buy-in", it is critical to be transparent and consistent with the data. Basing decisions on data provides quantifiable justification to the community and ensures that the community is asking intelligent questions and decisions about the services provided.

Finding #2

The geographic boundaries of Torrance are consistent resulting in similar levels of total response time service across the entire City. The main response travel time challenges are on the borders of the city. This is particularly noticeable in the northeast section of Planning Zone 93, the eastern border on Planning Zones 91 and 97, and near the western border of Planning Zone 94 (Torrance Beach).

Finding #3

For Code-3 responses, TFD's overall 90% performance for 1st unit total response time (call received until on scene) over a 4-year period is 7 minutes and 39 seconds. For 90% of all structure fires for the 4-year period the total response time for the arrival of the ERF, staffed with 16 firefighters and officers is 13 minutes and 27 seconds. These times do not comply with established benchmarks nor do they meet the community's #1 expectation in the 2018-2023 Strategic Plan for a "quick response".

Finding #4

The Department uses the Torrance Public Safety Dispatch Center to dispatch TFD resources. Calls are received by a call taker (typically a sworn police officer) that either transfer to the fire dispatcher, law dispatcher, or both. The dispatch center's overall 90% performance for call handling over the 3-year period from 2015-2018 is 1 minute and 54 seconds. This time is 49 seconds over the stated benchmark established in NFPA 1710.

Finding #5

The TFD 90% performance for turnout time on calls for the 4-year period from 2015-2018 is 2 minutes and 10 seconds. This time does not comply with NFPA 1710 standards of 60 seconds for EMS calls and 80 seconds for fires and special operations.

Finding #6

TFD unit hour utilization for the 3-year period from 2015-2017 ranged from 1%-16% which provides good response reliability and resiliency capabilities. TFD is not consistently capturing all forms of unit workloads for non-emergency workloads. The Department places on emphasis on reducing risks and preventing emergency responses. The TFD needs to better collect and report on all forms of workloads to demonstrate the outcomes of risk reduction activities, physical training, public education, station tours, etc.

Finding #7

Documenting EMS outcomes was labor intensive and required assistance from the Local Emergency Medical Services Agency. With the electronic Patient Care Report system that was placed into service in April of 2018, this should become more efficient in the near future.

Finding #8

High-risk fires, technical rescues, and hazardous materials events are very infrequent making it difficult to accurately define response performance; however, the community expects the TFD to be well trained and capable when a high-risk event occurs. That being the case, TFD should ensure that training for positive outcomes for high risk-low frequency events remains a priority and that it is well documented.

Finding #9

Meeting the 90% performance measurements established by the NFPA is difficult, but critical to meeting the community expectations outlined in the TFD 2018-2023 Strategic Plan.

Finding #10

Call volume increases significantly from 8am-8pm. The increased call demand and traffic patterns during the day are presenting challenges to the TFD when it comes to meeting the response time criteria established to meet the community expectations.

Finding #11

Call volume has increased by 6.94%, or 1070 calls, from 2015 compared to 2017. EMS and Traffic Accident calls account for over 79.9% of all TFD requests for service.

Finding #12

TFD documented 99 building or structure fires from 2015-2017. 51% of the building fires were contained to the object or room of origin. 65% of the building fires were contained to the floor of origin. 97% of all building fires were contained to the building of origin. Fire decreased in all fire call types in 2017.

Finding #13

Paper inspection forms need to be eliminated and replaced with a digital platform that makes data gathering and analysis more accurate and efficient. The Department has the funding for the project and is actively developing the format for future life safety inspections.

Finding #14

TFD ROSC (return of spontaneous circulation) performance improvement can be improved with increased bystander CPR and early AED use.

Recommendations

As a direct result of the community expectations survey conducted for the 2018-2023 TFD Strategic Plan and the systematic and labor intensive development of the 2018 CRA-SOC, the TFD has established the following recommendations to improve performance. These recommendations are complementary to the TFD Strategic Plan initiatives and support TFD's commitment to continuous improvement through self-assessment.

Recommendation #1 - The department should monitor and evaluate TFD baseline response time performance compared to nationally recognized benchmarks defined in NFPA 1710 on a more consistent basis. Developing a comprehensive performance improvement plan for not only excluding outliers in data, but addressing potential issues that can be addressed to eliminate future outliers will reduce total response times. Specifically, the department will evaluate and adopt strategies to reduce call handling and turnout times. Strategies will include using near real-time technology to improve response time results, providing immediate and effective feedback on performance, and automating the time stamps that make up the total response time. Call handling performance improvement will require the Communications and Public Affairs Assistant Chief to work cooperatively with the Police Department to explore opportunities for closing the gap between the baseline performance and the benchmark. Turnout times should be more closely monitored and Platoon Commanders should work diligently with crews to identify areas of improvement. The Department should focus on using our quality data; providing real-time feedback; and emphasizing improvement, not punishment as a means of improving total response times resulting in better customer service.

Recommendation #2 - The Department should develop alternative strategies to close coverage gaps based upon nationally recognized travel time standards and unit availability. With the increase in call volume, it is time for the TFD to consider dispatching the most appropriate level of care to calls for medical service rather than the highest level of care. BLS calls do not typically require an engine and a rescue to deliver quality patient care. Alternative strategies may include, but are not limited to, implementing emergency medical dispatching, exploring community para-medicine to reduce the impact of non-urgent calls, working cooperatively with all shareholders to reduce the impacts from the homeless population on the EMS system, exploring additional medical units during the peak demand hours, and reducing the number of Code-3 responses to less urgent calls of service. Due to the costs of quality employees in Southern California, it is no longer fiscally feasible to add additional 4-person engine companies staffed 24-hours a day, 365 days a year

at set call volume benchmarks without demonstrating a direct return on investment to the public. The Department must be willing to be innovative and try alternate deployment strategies to close gaps.

Recommendation #3 - An immediate alternative deployment strategy should be the consideration of Increasing paramedic services in Planning Zone 92 by upgrading the engine company from its current status as a paramedic assessment engine to a complete paramedic engine company. This unit would not require a Rescue to be dispatch on EMS calls in the south east portion of the city leaving them more centrally located where the call load is heavier which could improve reliability and resiliency citywide. Planning Zone 92 had 1371 EMS calls in 2017 which all required a rescue in the current deployment strategy. The fiscal impact of this change could be largely absorbed by moving the fourth paramedic position out of the Station 1 rotation to Station 2. The cost of equipment upgrades will need to be evaluated, but the cost would most likely have a nominal budget impact. It is recommended to run a pilot study for 1 year to measure the impact on services.

Recommendation #4 - The Department should identify, obtain, and utilize emerging information technologies and data management systems to improve department efficiencies, improve communications, reduce community risks and provide more effective response to all risk reduction and emergency responses. An example of this type of software program is Firstwatch, although it is not the only available program for monitoring close to real-time performance. The department should digitize life safety inspection forms for more efficient data collection and analysis regarding risks and risk reduction outcomes. Additionally, the department should utilize the new ePCR system to build data-driven and evidence based patient outcomes. Finally, the Department should consider consolidating data collection systems into one records management system when it is appropriate. Consolidating data collection systems allows users to become more familiar and therefore proficient in producing outcome reports.

Recommendation #5 - The Department must remain focused on being leaders engaged in all aspects of community. Developing and nurturing relationships allows department personnel to understand the community it serves. Additionally, it is an opportunity to share the return on investment by demonstrating the value of the services provided by the Department.

Recommendation #6 - As a result of risk reduction efforts and a reduction in major high risk events, the Department should focus training on high-risk/low-frequency events. The community expects the TFD to respond quickly and solve their issues with professionalism. In order to perform at a high level, it requires a commitment to training for events such as structure fires, hazardous material releases that affect public health, trench rescues, confined space rescues, etc. Training must be a priority in the budget and on the daily activity calendar.

Recommendation #7 - The Department should remain focused on continuous improvement through the CFAI model of accreditation. Additionally, Department leaders should ensure the model is integrated into all levels of the organization as a template for future success.

Recommendation #8 - The Department should continue to build upon risk reduction efforts in all risk categories. This includes life safety inspections, pre-planning, community education, community CPR,

additional AED's throughout the city, refinery safety, and expansion of preventive care programs related to community health.

Recommendation #9 - The Department should manage the daily activity schedule around peak call volume areas and capitalize on technology to maintain response coverage. Taking units out of their first-in in peak call hours is counterproductive to improving response time performance. The Department should utilize technology such as the smart classroom and "go-to meeting" when possible. These technologies allow units to participate in meetings and training and will allow for the city to remain covered. Meetings that require in person attendance may be scheduled in off peak hours.

Implementing the above recommendations will accomplish the following:

- Provide for a higher level of transparency and accountability with the objective of demonstrating the community's return on investment.
- Improve baseline performance across every service and program area to allow employees at every level of the organization to see how their efforts contribute toward the achievement of the Department goals and objectives.
- Enhance the credibility of the Department by clearly setting service-level expectations for the community with the available resources.

Section 8- Evaluation and Compliance Methodology

The graphic below illustrates the compliance methodology cycle the Department will utilize. The CRA/SOC will be reviewed annually and will be republished every 5 years.

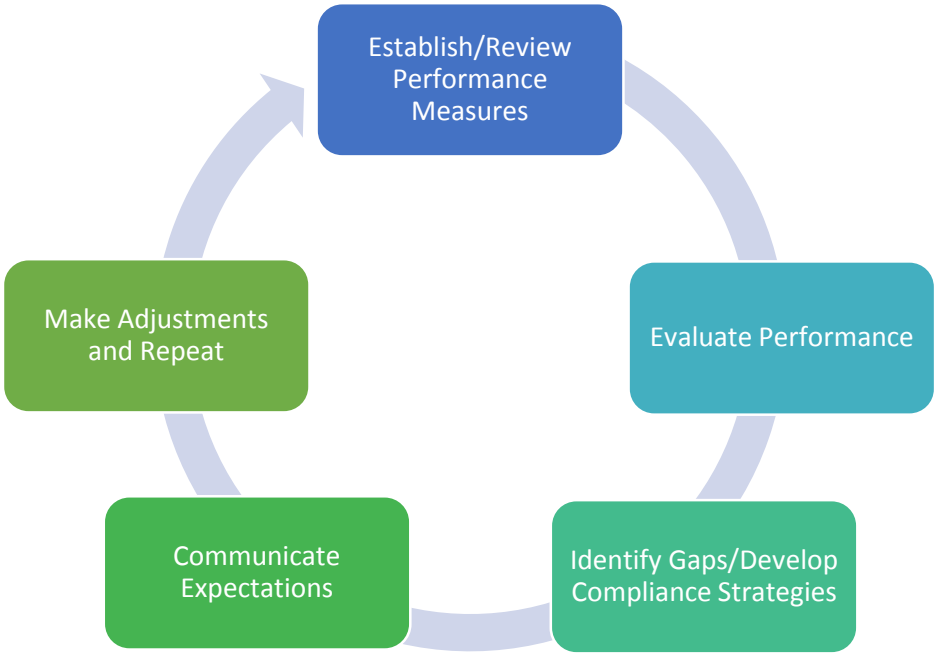


Figure 167: TFD Compliance Methodology Cycle

The Department will continue to report call volume and nature to the City management and City Council on a weekly basis. The weekly report includes the narratives from any significant incidents that may come up at Tuesday Council meetings. In addition, beginning in July of 2018, the Department will monitor and evaluate its performance and compliance quarterly and annually. The quarterly review, at a minimum, will include the following Code- 3 performance measurements:

- Call Handling Time
- Turnout Time
- Travel Time
- Total Response Time

Quarterly reports will be distributed to all operations personnel and public safety dispatch employees for review. In addition, the Chief Officers will review the report at a bi-monthly Company Officer's meeting and seek opportunities for improvement.

In 2019, the Department will expand the current quantitative annual report to include all CRA-SOC benchmark and baseline reporting criteria. The annual report will be distributed to all operations personnel and public safety dispatch employees for review. In addition, the Chief Officers will review the report at the first months

Company Officer's meeting and seek opportunities for improvement. The annual report will be reviewed to identify trends call volume trends, total response time gaps in services, negative trends, development trends and changing risks that affect the response area, and any recommendations for improvement.

The above reports are considered minimums. If at any time the Organizational Planning Division or Accreditation Manager determines the need, a detailed analysis can be conducted. The analysis will be presented to the Fire Chief for any potential action. Analysis may also be completed when requested by City Council or City Management.

The continuous improvement strategy will be accomplished through the review of the data as provided by the Organizational Planning Division to the command staff and public safety dispatch center through the quarterly and annual reports. While any member of the organization may make suggestions for improvement, it is the responsibility of the command staff to make final recommendations to the Fire Chief. The Fire Chief will review the recommendations for consideration and implementation based on the Standards of Cover, Community Risk Assessment, Strategic Plan, and Self-Assessment Manual.

Subsequently, the Fire Chief will determine the most appropriate actions to be implemented based upon these documents, labor group considerations, the values, vision and mission of the Department. When significant changes or actions are needed that may drastically change the level of service, the Fire Chief will provide this information to the City Manager and, as necessary, City Council, for review, consideration, and approval. Through regular evaluation of our response capabilities and constant communication, the TFD believes this process will strengthen our service delivery to our community.

Section 9 – References